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ON

CATARACT,
ARTIFICIAL PUPIL,
AND
STRABISMUS.

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ON CATARACT.

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CHAPTER I.

ON CATARACT.

SECTION I.—INTRODUCTORY OBSERVATIONS.

From the remotest antiquity, surgeons have endeavoured to remove cataract by operation. Celsus informs us, that amongst the physicians of Alexandria there were many who practiced this art, especially one named Philoxene, who was celebrated for his skill in this department of surgery. The Hindoos, whose surprising attainments in literature, science, the arts, and civilization, are traceable to a period anterior to that of the Greeks or Egyptians, not only treat of cataract in their most antiquated records, but continue, at the present day, to practice the operation of depression with the same rude materials which were at first employed. Most accurately-contrived eye-instruments have been found in the ruins of Pompeii. Yet, although the ancients operated, they knew not the real seat or nature of cataract. The Arabians considered the affection to be a drop of turbid water descended from the brain* ; and Celsus, who supposed the lens to be the seat

* Oriental synonyms:—Arabic **نصول** signifying descent.

ناخذة العين nail of the eye (probably from its resemblance to the white, shining, horny substance, of the semilunar part of the finger-nail.

Persian **ظفره چشم** from **ظفر** to prevail, or prevailing over vision, as the Greek synonyme **καταρακτα** implies breaking or disturbing vision.

Hindoostanie **موتیا بند** or pearl in the eye.

of vision*, attributed the disease to a pellicle between the uvea and the crystalline. It was not until the end of the seventeenth century, that the true nature and seat of cataract was ascertained. Kepler, in 1604, was the first who demonstrated the crystalline to be a refrangent body, and this led the way to the discovery of cataract being seated in that body, the merit of which has generally been conceded to Maitrejan, in 1707. Extraction of the opaque lens through the cornea, though attempted by the Arabians, can only be deemed an operation of modern date; their method was but imperfectly known, and the mode described by Ab-ool-Kasim, is very unsatisfactory; Daviel† published his method, in 1752, and to him, therefore, must be conceded the merit of first extracting the cataract by a semilunar opening of the cornea.

The illustrious Cheselden had the distinguished merit of showing, in the last century, that sight might be restored, in cases till then considered beyond the reach of art, by a new opening formed in a closed pupil. Various improvements and modifications have been introduced by modern surgeons since that period; and by the skill and ingenuity of a host of surgeons of the German, the Swiss, the French and the English schools, following up the one idea of that one master-mind, we are now enabled to enrol the various operations for artificial pupil amongst the most brilliant in ophthalmic surgery.

The object of the following pages is to give a fair *précis* of the best and safest modes of operating, which extensive practice can alone impart. That experience has been derived in the vast peninsula of India; not only in Calcutta, but from thence to Lahore, Delhi, and other populous cities of the East. One of the most gratifying

* Sub his gutta humoris est ovi albi similis, a qua videndi facultas proficiscitur, *κρυσταλλοειδής* a Græcis nominatur. Da medicina, lib. vii., p. 283.

† Sur une nouvelle méthode de guérir la cataracte par l'extraction du cristallin, dans les mémoires de l'Académie de chirurgie; t. iii., p. 213.

reflections of the past, is that of having restored many thousands to sight during eighteen years of foreign service.

II.—ANATOMICAL CONSIDERATIONS.

The greatest diameter of the crystalline lens is usually between three and four lines; and when the pupil is largely dilated, the whole anterior face of this body is entirely, or almost entirely, exposed. It has derived its name from its resemblance to crystal, in transparency. Its figure is that of a double convex lens, more convex anteriorly than posteriorly. The centre is of the consistence of wax slightly softened; its outer laminae are soft and gelatinous; these concentric laminae are intersected by radii which pass from the centre to the circumference. The laminae are composed of extremely delicate fibres, or threads, supported by a fine cellular tissue. Submitted to maceration, or boiling, the crystalline separates into three cortical layers, and usually into three triangular fragments. The lens has an outer investing membrane, perfectly transparent in the healthy state. This membranous capsule is separated from the lens itself by a limpid fluid called the liquor morgagni. The anterior portion of the capsule is thicker and firmer than the posterior.

The numerous and minute vessels of the lens are chiefly derived from the central artery of the retina; it also receives vessels from the vascular layer of the retina, and from the vessels of the ciliary processes.

The circumference of the capsule of the lens is bounded by a triangular-shaped canal, which was first described by Petit; internally, the space corresponds to the circumference of the capsule; posteriorly, to the hyaloid membrane of the vitreous body; and anteriorly, to the membrane of the zonula ciliaris.

The crystalline body performs a most important office in the eye, by producing a convergence of the rays of light which enter through the pupil, so as to concentrate them upon the retina.

The density of the exterior of the body being less than that of the centre, the refractive power is less in the former than in the latter part of the lens; this, probably, corrects the error which exists in all artificial lenses in consequence of the uniform density of their composition, and which is termed the *aberration of sphericity*.

Before entering into the consideration of the pathology and varieties of cataract, it may be well to take a cursory view of the general symptoms and diagnosis of this disease.

III.—SYMPTOMS AND DIAGNOSIS.

The first symptom complained of by the patient is a dimness of vision; a mist or fog floating before the eyes; luminous bodies, as the flame of a candle, are seen with a halo around them, or one candle has the appearance of having a double wick. In reading there is, generally, much confusion, one letter running into the other. The patient sees better with his back to the light, or during twilight, because the pupils admit of greater dilatation than when the eyes are directed towards the light, or when the light is too intense; rays of light are thereby admitted through the transparent periphery of the lens; for the same reason the patient endeavours to look slantingly at objects. The use of bella-donna, or atropine, by dilating the pupil, improves vision for a time. This state of things gradually increases up to almost total blindness. Where objects are seen double, or multiplied, this may be attributed to the existence of opaque radii passing from the centre to the circumference of the lens, which may cause an irregularity of outline, or distortion of straight lines, in objects not luminous (Tyrrell); and further act as the surfaces of a kaleidoscope, in multiplying those especially of luminous character. May it not be accounted for by the three triangular portions of which the lens is composed (and which may be isolated in the foetus), ceasing to be in optical contact?

Diagnosis —The diseases with which cataract is most

likely to be confounded, are glaucoma and amaurosis. The history of the affections from the earliest stages, the symptoms, and, above all, the examination of the eye itself, are the sources from which a correct diagnosis is to be deduced.

With the exception of its occasional origin in mechanical injury, cataract is rarely preceded, or even accompanied, by any symptoms, local or general, which have been sufficiently marked as to draw to them the attention of the patient, excepting, of course, the impediment to vision; whilst glaucoma, usually commences with symptoms of inflammation, as pain of the eyes and temples. In amaurosis, the patient is subject to illusions; sometimes objects appear to him deformed, at others he only perceives limited portions of objects, seeing for example, in a line, the words in the centre, whilst those at the commencement and termination are unperceived. Amaurosis, at its commencement, is frequently traceable to very evident causes directly influencing the retina, or some portion of the optic nerve. In glaucoma, an obscurity of a greenish hue, and concave, exists at the bottom of the eye; the iris is changed in colour, the pupil is dilated, often deformed and immoveable; the colour of the sclerotica is blueish, and the vessels of the conjunctiva are varicose and bifurcate around the margin of the cornea, under the form of arcs, which has been termed by the Germans arthritic or abdominal; finally, the morbid action extends to the lens itself, which assumes a green colour, enlarges, and presses forward through an irregularly dilated and distorted pupil; and vision in the latter stages is utterly abolished. In amaurosis, the pupils are usually dilated, and the iris sluggish, or altogether insensible to the impression of light. The enfeebled vision is frequently accompanied by flashes of light, and the appearance of dark specks or *muscæ volitantes*, though this latter symptom, which also occurs in cataract, has no great value as a diagnosis, except in connection with the other

symptoms. The amaurotic, as well as the glaucomatous eye, sees better in a brilliant light; which, it has been stated, is not the case in cataract. In amaurosis, there may be little or no obscurity even when complicated with cataract, and yet the individual may be almost totally blind. In the advanced stages of amaurosis and glaucoma, the peculiar gait and stare of the patient cannot be mistaken; he seems anxious for the light; he advances with the head erect, and with a vacant look, as the amaurotic poet has so graphically described:—

“ ————— but thou
Revisit'st not these orbs which roll in vain,
To find thy piercing rays, but find no dawn.”

In cataract, on the contrary, he seeks the shade, and gropes with a downward look and contracted brows. In the early stages of these affections, where there is any difficulty in the diagnosis, all doubt will generally be removed after the artificial dilatation of the pupil with the solution of atropine, and by an attentive examination through a glass of strong magnifying power. If there is any reason to suspect the existence of amaurosis in the eye, in connection with cataract, whilst the other eye is sound, it is a judicious maxim to cover the sound eye during the examination, as the iris of the opposite amaurotic eye might otherwise be influenced by sympathy with the other. In cataract, we have a dead cloudy body not reflecting the rays of light which is usually convex, and always situated in the anterior part of the eye, whilst in glaucoma, we have, at first, a deeper seated obscurity which reflects the light. In cataract, the indistinctness of vision is in a direct ratio with the degree of opacity; in glaucoma and amaurosis, the vision is considerably impaired, before any visible alteration in the transparency of the dioptric media can be detected. Cataracts of a green colour are not unfrequently met with, usually complicated with glaucoma; but even where there is no such complication, and where the

movements of the iris are regular, I believe that no benefit will be derived from an operation. This fact, though often lost sight of, is as antique as Professor Celsus himself, who tells us—"si suffusioni color cœruleus est, aut auro similis, vix unquam succurritur."

IV.—PATHOLOGY.

Opacity of the crystalline lens or its capsule, constituting what is termed cataract, may be situated either in the anterior portion of the capsule, in the lens itself, or in the posterior part of the capsule. These parts may be separately or jointly affected.

The *lenticular* cataract is of very frequent occurrence, and is that form of the disease which usually attacks persons advanced in life. Its colour is grey, the centre approaching to amber or brown. The obscurity usually commences in the centre of the lens, and extends towards its periphery, and the deeper the tint the harder is the cataract. In this form of disease, the lens is diminished in size. In the soft form of lenticular cataract the lens is somewhat increased in bulk, so as to appear more than ordinarily prominent, and to press forward the iris, and diminish the anterior chamber; vision is more obscure than in hard cataracts, and the movements of the iris are not always so active. These soft cataracts present a greyish, and often a milky appearance. The movements of the iris are not so active; and when the pupil has been dilated by any of the usual means, it does not so soon recover its original diameter. There is no darkened shadow cast on the edge of the lens by the iris, which is the case in hard cataract. This phenomenon is easily accounted for;—thus, if we interpose a ring between the light and a piece of white paper, we shall observe upon the surface of the latter a distinct circular shadow when the ring is at a certain distance from the paper, but diffuse when the ring is further withdrawn. In a cataractous eye, the ring is the pupillary circle of the iris, and the body on which the

shadow falls is the opaque crystalline. There is often a mixed variety of cataract in which the central nucleus of the lens is extremely hard, whilst the outer portions are soft even to fluidity.

Capsular cataract more frequently affects the *anterior* than the posterior portion of the capsule, and this far more frequently as a consequence of inflammatory action, especially in connection with iritis. Opacity of the anterior capsule is of shining whiteness, resembling either mother-of-pearl or the egg-shell of the domestic fowl. It is often observed to be spotted or streaked with alternate lines of a white, opaque, glistening character, and others of a more clear and transparent nature; the convexity of the lens, and the fact of the anterior surface being nearly on a level with the edge of the iris, affords another marked peculiarity. The opacity is in general uniform in crystalline cataracts: if the centre is always deeper than the periphery, the transition from one tint to the other is gradual and almost insensible; in the capsular affection it is more abrupt, and as it were cleanly cut. This will be particularly manifest when the pupil has been well dilated. Opacity of the *posterior* capsule, without obscurity of the lens itself, is exceedingly rare. Even where it does exist it is difficult to be distinguished. Authors mention the depth and concavity of the obscurity as characteristic of this affection; but such appearance, it has been justly remarked, may be equally attributed to opacity of the posterior laminae of the lens itself. It has also been observed, that posterior capsular cataract only slightly impairs vision. Mr. Lawrence mentions an instance of a patient who could read with facility when the pupil was dilated by the belladonna: the cataracts were large, and the transparent parts could be distinctly perceived through which the light was transmitted.

The *cataracta morgagni* has been stated, by Wenzel and others, to exist as a separate disease, whilst the lens has retained its transparency. In operating for extraction,

I have often seen this fluid quite milky, but always in connection with opacity of the lens itself, which has usually been quite hard. Sometimes the cataractous lens has escaped, on completing the section of the cornea, enveloped in its entire capsule, which contained this opaque morgagnian fluid in considerable quantity. I have often, likewise, seen this milk-like fluid burst into the anterior chamber on performing the operation of reclination; indeed, to a practised eye, it is easy to recognise the opaque hardened lens, of an amber or brown colour, in the midst of the white morgagnian fluid which gravitates to the bottom of the capsule, occupying its inferior half in a semilunar form.

In *capsulo-lenticular cataract* the opacity may have commenced with the capsule, and thence extended to the lens, or *vice versâ*; or both structures may have been simultaneously affected from the first. In this variety of disease the lens itself is often soft, and the cataract is consequently very large. This form of the affection is evidenced by the silver streaks of the anterior convex surface of the capsule, and the opaque lens being seen through the interstices different in colour and appearance.

Black cataracts, and cataracts of bony hardness, are both exceedingly rare; but that they do occur, I have no doubt: the former are too well authenticated to be questioned*, though I have never seen them, and the latter I have once myself met with, but only once, in many thousands of cases.

The various other distinguishing names which have been bestowed by authors on the different forms of cataract, especially by those of the German school, can tend to no practical result. They are summed up with almost sarcastic brevity, in the words of Professor Velpeau:—"En d'autre termes, toutes les fois que le cristallin et sa capsule sont seuls malades, q' à part la cataracte, l'organe est dans l'état naturel, et que l'orbite

* Velpeau; *Médecine Opératoire*, Paris 1839, p. 338, tome iii.

ne renferme rien qui empêche le rétablissement de la vision, que la cataracte soit vraie ou fausse, par exudation plastique, ou par retour du cristallin à l'état embryonnaire, lenticulaire, capsulaire, ou capsulo-lenticulaire, membraneuse antérieure, ou membraneuse postérieure, dure ou molle, laiteuse ou gypseuse, barrée; branlante, étoillée, perlée, à trois branches ou centrale, purulente, putride, tachetée ou en treillage, marbrée, sèche, ou en gousse, sanguine, dendritique, jaune, grise, ou noire, l'opération doit être conseillée."

V.—CAUSES OF CATARACT.

The proximate cause of this disease must still be considered as involved in much obscurity. A more perfect acquaintance with the optical functions of the eye, and the mechanism of the dioptric media, has thrown, however, some light on the pathology of cataract. Science is indebted to Sir David Brewster*, Dr. Mackenzie†, Professor Sanson, of Paris‡, Dr. Staberoh, of Berlin§, and other modern writers. It is to be hoped that animal chemistry will elucidate this intricate subject.

Capsular cataract appears to originate in a chronic form of inflammation, in which the lens sometimes participates, as minutely described by Professor Walther||.

Very different, however, is the proximate cause of lenticular cataract. The disease has been supposed hitherto to originate in defective nutrition of the crystalline lens, a sort of necrosis, or gradual decay of its texture, inde-

* Sir D. Brewster's "Treatise on Optics," and in the "London Medical Gazette," 1837-38, p. 523; also "Edinburgh Journal of Science," No. i., p. 77; and "Philosophical Trans.," and Reports of Proceedings of the British Association.

† Dr. Mackenzie's "Practical Treatise," and "London Medical Gazette," page 105, for 1837-38.

‡ Quoted in the "Medical Gazette," by Dr. Mackenzie.

§ Ditto, ditto.

|| "Abhandlungen aus den Gebiete der protischen Medicin," vol. i., p. 58, Landshut 1810.

pendantly of any inflammatory action. Sir David Brewster, by a series of experiments on the crystalline lenses of animals, has been led to discover that the capsule of the crystalline is a membrane which performs the functions of *endosmose* and *exosmose*, keeping up a due proportion between the aqueous element in the aqueous chamber, and the lens. "Even in the dead state this membrane imbibes distilled water so greedily, that the lens which imbibes it becomes quite soft, expands, and bursts. Viewing the capsule in this light, there can be no doubt that *soft cataract* arises from an excess of aqueous humour imparted to the lens through the capsule, and that *hard* or *dry cataract* arises from a defect of *water* in the aqueous humour, or an *excess of albumen*." Sir D. Brewster considers *presbyopia* or *long-sightedness*, which occurs so frequently between the ages of 30 and 40, to be but the commencement of those changes which so often, if neglected, lead to hard or dry cataracts. These changes commence generally in the margin of the lens, and if they do not advance favourably and uniformly along the circumference of that body, the fibres, and even the laminae separate, or cease to be in *optical* contact.

Whether this doctrine of Sir David Brewster be received or not, we are quite certain that cataracts may be distinguished under two grand classes, viz.—first, those originating in inflammation, as in the congenital form, and probably under metastasis of rheumatism and gout, and in internal or external phlegmasiæ, or traumatic, as in injury of the capsule; and, secondly, those depending on a sort of necrosis of the lens, and which is to be sought for in the deviation of those laws and minute phenomena connected with the subject of nutrition. This most frequently occurs in old age, at which period of life the obliteration of capillaries much more voluminous than those which nourish the lens takes place, and which general tendency to obliteration we may, *a fortiori*, presume, is calculated to produce atrophy of so delicate a

structure as that of the lens. The first class of cataracts are characterised by softness, or even fluidity, of the lens, and may be said to be that form of disease appertaining to persons under the age of 50, and corresponds to Sir D. Brewster's class, in which endosmose is plus, and exosmose minus; the second class are characterised by hardness, in which endosmose is minus.

Numerous facts are recorded in proof of an hereditary predisposition as an occasional cause of cataract.

Persons exposed to the action of calcareous dust are, according to Beer, predisposed to the disease. Such an opinion certainly receives some confirmation from the fact of the great prevalence of the disease in Upper India, where the natives are exposed to the dust of the calcareous soil of those provinces. Tartra states that a young man was exempted from conscription on account of cataracts, which he had induced by the use of a lotion of nitric acid. "If," says Dr. Deval, "the cornea permits the exudation of the aqueous humour through its pores, and which mixes with the tears, why may not acid solutions, placed in contact with the anterior surface of this tunic, penetrate also through this substance, and, acting directly on the lens, coagulate the albumen of which it is found, by chemical analysis, to be in a great measure composed?" It is by no means improbable, that cataract may arise from a predominance of acid in the system, particularly of the phosphoric acid in gouty subjects. Dr. le Roy (d'Etiolle), author of a very remarkable work on the formation of cataract, concurs in the above opinion; and considers that, not only inflammation of the capsule, but concentration of the solar rays upon the eye, and electricity developed within us and without us, are powerful causes of the coagulation of the albuminous lens.

VI.—CONSTITUTIONAL TREATMENT.

It is hardly to be expected, that in cases of confirmed cataract, any constitutional or local treatment will restore

the lens or its capsule, to their pristine transparency ; and, therefore, in the vast majority of such cases which present themselves to the ophthalmic surgeon, we can do little more than palliate symptoms, and improve the vision by the use of belladonna, or atropine.

Where the belladonna will not act, the solution of atropine, in the proportion of four grains to the ounce of distilled water, with a little spirits of wine, will generally be effectual. But when the surgeon is consulted in the earlier stages of the disease, I am far from coinciding with the too prevalent opinion, that all medical treatment is of no avail. On the contrary, I believe that, under favourable circumstances, we may often succeed, if not in removing, at all events in greatly retarding, or even arresting, the further progress of the affection.

If cataract is a disease of the constitution, if it is often hereditary, it is surely a rational practice to attempt to retard the progress of the disease by constitutional treatment. In the first class, whether of a palpably or obscurely inflammatory character, I believe that derivatives, the local abstraction of blood, counter-irritation, and a mild alterative course, combined with assiduous attention to the general health and constitution of the patient, is decidedly efficacious. On the other hand, whatever imparts tone to the system, improves the general health, and increases the capillary circulation, (not omitting the warm bath, with mild alteratives and tonic aperients,) is calculated to retard the advancement of the second or senile class of cataracts. Where there is a gouty or rheumatic diathesis, or a tendency to the predominance of lithic or phosphoric depositions in the urine, such remedies and regimen as tend to correct these states will be indicated. In debilitated habits, quinine, and other tonics, nutritious diet, with wine, regular exercise, and early hours, and the shower-bath. Frequent ablution of the eyes and temple with cold spring-water, and even dipping the head, and opening

the eyes, in a large basin of cold water, is almost of universal application; "its bracing and tonic effects," says Mr. Jeffreson, "on the minute blood-vessels, nerves, and tissues, are well known, and the comfort immediately experienced from the practice, is of itself no small recommendation." The following remarks of the same Indian brother-practitioner are so completely in accordance with my own, that I cannot avoid quoting them:—"In fact, the whole system of bathing, whether using the hot, warm, tepid, cold, vapour, or shower-bath, habits so prevalent in other countries, as to constitute a national feature and character of the people, are too much neglected in this highly civilized, but too busy, land." I am constantly in the habit of sending my poor patients, at the Western Infirmary, to the Euston Square baths, and I find this no small auxiliary in the treatment of many strumous, rheumatic, and other affections of the eye.

Where an opacity depends on an inflammation of the capsule in which the iris is usually involved (irido-crystalloidite of continental writers), we distinguish, by means of a magnifying glass, an unpolished surface, like glass exposed to the vapour of the breath, with here and there more marked opacity. This form of disease, whether connected with a syphilitic taint, or otherwise, is best treated by mercury and iodine, internally (preserving the pupil constantly dilated by means of belladonna), and by mercurial and iodine frictions to the forehead and brow. In robust subjects, blood-letting, purgatives, and derivatives are indicated. If the disease has originated from the suppression of any cutaneous eruption, it will be necessary to establish an artificial irritation, if possible, in the neighbourhood of the former disease.

The instances of spontaneous cures of confirmed cataract, related by authors*, can only be attributed to accidental

* Janin; p. 154. Boyer, *Traité des maladies chirurgicales*, tom. v., p. 514. Serres, *Bulletin général de thérapeutique*, tom. xv., p. 378, (1838).

concussion, or wound of the capsule; they are, in reality, the operations of depression or solution performed by nature instead of the surgeon. These accidental cures are extremely rare.

VII.—PRELIMINARY CONSIDERATIONS RESPECTING THE REMOVAL OF CATARACT BY OPERATION.

When both eyes are affected with cataract, and each cataract nearly mature, ought both to be operated on at the same time? To this question I should decidedly, from experience, reply in the negative; because we know not what circumstances may occur, inducing serious accident, or dangerous inflammation, and that in all instances, and with all operations, it is infinitely preferable to allow the patient two chances instead of one. The following may be quoted out of many:—*Case*,—A lady consulted me in London, for cataract of both eyes. She was quite unable to distinguish more than the mere shadows of objects. She was subject to rheumatism, and was very nervous and irritable; the anterior chamber was rather small. Under these circumstances, I placed her under a mild constitutional treatment, consisting of a slightly alterative and aperient course, and an occasional warm bath, due attention being paid to regimen. A fortnight afterwards I operated on the right eye, preferring, in this instance, the compound operation of solution and displacement. After twice rupturing the capsule through the cornea, and exposing the outer softer laminae of the lens to solution, I performed the operation of reclination. No untoward symptom occurred; and, at a subsequent period, the patient being in a favourable condition for operation, I performed the operation of extraction on the other eye, with equally happy results. In extraction, this rule is especially important, inasmuch as double extraction exposes the eye to greater risk. But by operating only on one eye at a time, we often observe, in the course of the operation and recovery, some particulars

which will be essentially useful to us in conducting the second operation, or will even lead to a more suitable method of operating on the second occasion. I have often had reason to congratulate myself and patient on the prudential caution here recommended.

It is often highly important, in all practicable cases, for the patient to undergo some preparatory treatment. In healthy constitutions, I generally prescribe a warm bath, one or two doses of aperient medicine, and a light, easily-digestible diet. This, however, is seldom applicable to the natives of India, not only from their aversion to delay, and from their proneness to lose confidence, but from their physical energies and vital powers being frequently much depressed. In the wealthier natives, it is sometimes necessary to lower their diet, but with the lower orders, it is scarcely necessary, from their abstemious and temperate habits. A long and tedious preparation is seldom requisite, even in the robust European, excepting where there is an undue plethora, or local determination. No precise rules, however, can be prescribed. In each individual case we must be influenced by the peculiarity of constitution and condition of the patient. In some few, venesection may be requisite, and should the blood prove sizy, it would be highly injudicious to proceed to an operation. Purgatives, and in some, an alterative course may be necessary, and a strict antiphlogistic diet a fortnight previous to operating. In debilitated habits, on the contrary, it is absolutely necessary to increase the powers of the system by nourishing diet, tonics, and stimulants.

In cases of congenital cataract, ought the operation to be delayed until the patient has attained an age sufficient to enable him to give his assent, or ought it to be practised during infancy? It is greatly preferable to operate in infancy. About the age of three months is the period most to be preferred. At such an age the infant is unconscious of what is going to be done, and a simple

puncture of the cornea is easily accomplished without alarming the little patient. At this early age the habit of rolling the eyes has not been acquired, and which, when once acquired, subsides with difficulty. The anterior operation for solution, which is the safest, is attended with very little risk of irritation, or subsequent inflammation.

I do not, however, at all coincide in the opinion that the retina, from want of being exercised, loses power. I believe this to be by no means a strong argument in favour of an early operation, for I have myself restored to excellent vision many patients who have been born blind, although they only applied to me for relief at the age of from 16 to 25 years. I have inserted in a note at the end of this essay, some cases of congenital cataract, operated on at a very advanced period of life, illustrating not only the preservation of the powers of the retina for a very long period, but likewise the fact of the voluntary efforts over the muscles, and a very useful degree of vision, being attained. They by no means, however, invalidate the general rule which should guide us in operating on all congenital cataracts at an early period, whenever they are presented to us.

SECT. II.—EXTRACTION OF THE CATARACT.

In considering this particular kind of operation, which I proceed first to describe, I would premise that although I consider it infinitely superior to any other mode of removing the cataract where the cases are judiciously selected, and the operation skilfully performed, yet it must ever be insisted on as an important rule of practice, not to select one operation with a view of practising it exclusively, but to consider the peculiar circumstances which give a preference to the one or the other, and to select in each instance that which is best suited to the particular form of the complaint; for, each method has its advantages, and is eligible under certain circumstances. In the upper provinces of India *extraction* succeeds better

than in Bengal. In the natives of the latter province the deepness of the orbit, smallness of the anterior chamber, their weak constitutional powers, owing to the poorness of their diet, render the reparative effort so weak as to hazard the non-union of the incision of the cornea, making this operation peculiarly inapplicable to them. Mr. Egerton, whose experience is very great in Bengal, seldom extracts for the above reasons.

The operator should have a good eye ; a steady, light, and skilful hand ; a delicate touch, confidence and caution ; and without these essential qualifications he had much better restrict himself to the simple operation of depression, or reclination. The operation of extraction can be resorted to only in adults.

The surgeon cannot be too particular with regard to the *delicacy*, *sharpness*, and *temper* of his instruments. The requisite instruments for extraction are as follows : Two cornea knives for making the section of the cornea (fig. 1), a curved knife for enlarging the section, if required (fig. 2), a curette (fig. 3). The cornea knife should have a very keen edge, and ought to be made to increase in breadth *suddenly* from the point to the shoulders, so that the section of the cornea may be completed by a single thrust before the point of the knife reaches the nose. The knife should be smooth and without any irregularities on its surfaces, and gradually increasing in thickness from the point to the shoulder, in order that the aqueous humour may not escape until the section is completed. I usually try the temper and sharpness of the knife on the thin skin of my own wrist.

The light should fall obliquely from the upper half of the window. In fact, the light must be regulated in the same manner as by an artist or miniature painter. A northern aspect, in our latitudes, affords a more uniform and less dazzling light.

Extraction may be performed by placing the patient horizontally on his back, or by seating him in a chair.

In performing the superior section, I always give the preference to the former, laying the patient on a couch, because the operator is less dependent on the precarious aid of assistants, and has better control over the patient, and there is less danger of the escape of the vitreous humour. The surgeon has the important advantage of holding the superior lid himself, whilst the summit of the patient's head is in contact with the operator's breast. All that is required of the assistant, is for him to depress the lower lid, by placing his finger towards the inner canthus, immediately in contact with the ball of the eye, without pressing upon it, and holding the lid steadily against the inferior orbital ridge.

The other hand of the assistant is to be placed under the chin of the patient, for the purpose of preserving the steadiness of the head.

In the oblique external section, the assistant must support the superior lid, whilst the surgeon assumes a different position by the side of the patient, and supports the inferior lid himself with the fore and middle fingers of the opposite hand to that with which he operates.

The assistant must be aware of one point, which should be decided on between him and the operator before the operation is commenced; viz., to let the lid go before the section of the cornea is completed; and the operator should communicate to the assistant by a sign, as soon as he has nearly finished the section. *Especial* care is to be taken that the operator's middle finger is so placed on the caruncula lachrymalis as to prevent the eye from rolling inwards, otherwise he might find it impossible to complete the incision. The operator should be seated at a convenient height behind, resting the hand with which he operates on the patient's temple, and his elbow on his thigh or knee. If the operator be not ambidexter, he will find himself very awkwardly situated in operating on the patient's left eye, and in that case he had better reverse the position of himself and assistant, and seat the

patient on a chair with an upright moveable back, in the usual way, and the patient is to be requested to look straight up, directly at the operator, who is intently looking over his face. The opposite eye is not to be bandaged, otherwise the direction of the eyes of the patient cannot be so well regulated. No general pressure should be permitted either by the operator or the assistant, although the fingers are to be dexterously employed in regulating the movement of the eye-ball, whilst, at the same time, the eye is to be fully and clearly exposed.

The pupil should on no account be dilated by the belladonna, otherwise the edge of the iris will fall on the knife, before, or even after it has completed the punctuation—see fig. 4.

The operation may be conveniently divided into three periods. In the *first* the incision of the cornea is effected. In the *second* the anterior hemisphere of the capsule is opened, or rather destroyed as much as possible. In the *third*, the exit of the cataract, or the extraction, properly so called, is accomplished. The knife should have a very keen edge, and become gradually broader and thicker from its point backwards. It cannot be too sharp, and its point must be very acute—fig. 5. The point is double-edged to the extent of a line. It should be well oiled previous to using it.

1st. Period.—A dose of Morphia, or of the sedative solution of opium having been administered an hour previously, and the patient being placed in the position described, the lids secured, and the necessary instrument and bandages adjusted, the surgeon ascertains the steadiness of the eye, by gently touching the globe with the extremity of his finger: should the eye at this warning become unsteady, the surgeon must endeavour to divert the patient's attention by some questions irrelevant to the operation, and calculated to engage his mind. The cornea is to be punctured about a line from its margin, and near its transverse diameter. The point of the knife,

held as a pen or pencil, is entered midway between the margin of the cornea and the edge of the pupil, and inclined somewhat towards the centre of the eye, lest it should enter between the laminae. The knife is then carried along the anterior chamber, with its side parallel to the iris, and its point is brought out at that part of the cornea exactly opposite to where it entered; the transfixion is thus accomplished, and by pushing the knife steadily and rapidly forward, without any sawing motion, a semicircular section is effected. The section should be something more than semi-diameter, nine-sixteenths of the circumference should constitute the extent of the segment.

In traversing the anterior chamber, the operator should be very particular in directing his attention solely to the point of *counter-punctuation*; by so doing, the point of the knife is sure to follow; whereas, if he allows himself to be diverted by any other object, he will very probably miss his aim. The moment transfixion is accomplished the operator has complete command over the eye, and all pressure should be taken off. The assistant should immediately withdraw his finger. In pushing the knife forward to complete the section, the handle of the knife is to be kept *well back*, so that the extremity of the blade may avoid touching the nose as it advances; and the knife should be lightly raised *upwards*, and the fore finger of the operator's other hand pressed lightly on the cornea, thus holding the cornea as it were between the surface of the knife and that of the finger. These points are most important; the raising of the knife saves the iris from coming in contact with its edge, whilst the cornea being fixed between the finger and edge of the knife, nothing can intervene, and the iris must remain uninjured. If the aqueous humour has been entirely retained until now, the knife may be turned a little on its axis, so as to allow the fluid to escape, otherwise the pressure of the knife on the aqueous humour might burst the hyaloid

membrane, particularly if that membrane is weak, as it often is in advanced life, and thus cause ejection of the vitreous humour. The instant the section is completed the knife is withdrawn and the lid allowed to drop, being covered for a few minutes with the hand, till all spasmodic action has subsided and the pupil has become dilated. The chief danger, so far as depends on the dexterity of the operation, is over, and the patient should be told so. The light of the apartment ought now to be moderated.

2nd. Period.—So soon as the patient has had time to become composed, and that the eye appears perfectly tranquil (for there is now not the slightest necessity for hurry), the eyelids are to be gently raised, without bringing the points of the fingers over the edges of the lids, and a curved needle (fig. 6,) is to be introduced for the purpose of making a circular and crucial laceration of the capsule; a *slight* degree of pressure ought at the same time to be made, so as to cause the cataract to advance towards the cornea, and the pupil to yield gradually to the advancement. By this means the capsule will be more freely exposed to the point of the needle.

3rd Period.—Very gentle pressure is now exerted on the globe of the eye, in order to force out the lens; indeed, the pressure which was used during the 2nd period of the operation if continued, is generally followed by the exit of the lens, but it will be more advantageous to pause for a short interval. Should the lens not readily pass out through the wound of the cornea, it can be removed from the anterior chamber by a small scoop which is usually attached to the opposite extremity of the same handle in which is fixed the needle for opening the capsule. Any remaining opaque substance should likewise be removed with the curette or scoop. Before closing the eyelids, the cornea ought to be carefully adjusted, any matter lodged between the divided surfaces removed, and the margin of the lower lid so placed

as not to disturb the flap. The eye is now allowed to rest.

When the patient has recovered somewhat from the confusion arising from the admission of light into the eye, the opposite eye may be closed, and the patient permitted to open that which has been operated on, with his back to the light, to ascertain whether he sees. Having satisfied his anxiety on this point, he should be put to bed, or allowed to remain in the same horizontal position on the couch with the head well raised, and directed to close the eyes without force, as though he were asleep. Before finally closing the lids, however, the eye should be again turned to the light, and the surgeon should repeatedly and gently rub the upper lid over the surface of the eye-ball, raising the lid, and rapidly examining the appearance of the pupil and state of the flap. Having ascertained these points, the patient is to be desired to look up, and the eyes are then finally closed with court plaister.

After Treatment.—After the operation, the application to the eye should be light, some carded cotton dipped in white of egg is the best; and both eyes should be bandaged. The room is to be kept perfectly quiet, in order to avoid all sudden alarm or starting. Diet, chiefly fluid is to be taken, and complete rest and silence must be strictly enjoined. I usually prefer that the patient sleep upon the same couch on which he has been operated on, but if he must be removed to a bed, he should be as passive as possible, and especially avoid stooping. He should remain on his back with the head and shoulders raised, or may incline occasionally to the side opposite the eye which has been operated on, and the light should be excluded, either by closing the shutters or drawing the window curtains. The patient is to suppress any inclination to cough or sneeze, and it is by no means superfluous to secure the wrists at a certain distance from the side of the bed, by means of tapes, so that the

patient cannot raise his hands higher than his mouth, otherwise he might incautiously attempt to rub his eyes.

If the patient is restless, it will be advisable to administer a narcotic. No laxative should be administered for forty-eight hours after the operation. The lids should be gently washed with tepid water and a soft rag, to remove, as much as can be done with safety, the incrustations. Each time the dressing is changed, the lower lid should be drawn a little downwards, to allow of any lachrymal secretion or aqueous humour escaping which may have accumulated behind the lids. Under favourable circumstances the union of the cornea occurs in less than twenty-four hours, but the eye should not be exposed or used for a week.

Modifications of extraction according to the varieties of cataract.—1. If the eye to be operated on is more than ordinarily prominent, the incision ought not to be made at the lower edge of the cornea (even though the operator should prefer the inferior section under ordinary circumstances), lest the lower lid should intrude into the wound, and prevent it from healing by the first intention. The incision should be either at the temporal or upper edge of the cornea.

2. It sometimes happens that the cornea is not only remarkably flat, but the iris appears to project forward in the anterior chamber, forming a convex instead of a plain surface. In cases of this description the anterior chamber is so small that if any attempt be made to complete the division of the cornea by the semi circular incision, it will be found extremely difficult, if not impossible, to carry the knife from the temporal to the nasal edge of the cornea, without wounding the iris. Under such circumstances, therefore, it is advisable to include only one-third of the cornea in the first incision, and afterwards to enlarge the aperture by means of Daviel's scissors (fig. 7), of which there should be two of opposite curvature, one for the right and the other for the left

side, or a curved knife; or else to select the compound operation of solution and depression, or solution and extraction to be afterwards described.

3. In cases of floating cataract, such as the cystic, of capsular cataract, and of cataract combined with dissolved vitreous humour, it is not necessary, and often not safe, to extend the incision to a semi circle. It will be sufficient, under such circumstances, to divide one-third of the circumference of the cornea, and through this small incision to extract with the assistance of a hook.

4. In cases of capsulo lenticular cataract it is proper to attempt the extraction of the capsule as well as of the lens. The cornea being divided in the usual way, a needle may be introduced, a little bent towards the point, with which we may attempt to divide the capsule in a circular direction, as near the edge of the pupil as the instrument can be applied without injuring the iris. The part included within the circular division may sometimes be brought away on the point of the needle; but if this cannot be done, it should be extracted by means of a pair of small forceps, and then the lens is to be removed as in ordinary cases. Or, it may be removed by the tooth-bladed forceps of Beer.

The posterior capsule of the lens may be sometimes known to be opaque, from the history of the case; or immediately after the lens is removed, we observe that there still remains an opacity impeding vision. If we are satisfied that this opacity consists neither in opaque shreds of the anterior half of the capsule, nor in some portion of the soft exterior substance of the lens retained (as it sometimes is) in the eye, then we may conclude that it is the posterior hemisphere of the capsule in an opaque state. The best plan in such a case is to allow the eye to recover from what has already been done, and, by a subsequent operation with the needle, to endeavour to remove the opaque membrane out of the axis of vision. Some, however, have recommended that we should immediately proceed to destroy, and if possible to remove the

posterior half of the capsule. This has been attempted by means of a barbed or hooked needle; but such a procedure is too apt to be followed by the escape of a large portion of vitreous humour.

Accidents during or after extraction.—Where the case for extraction has been judiciously selected, on an eye in every respect healthy, a transparent cornea, the anterior chamber of a proper size, the pupil regular, the iris steady, and not protruded, and the cataract solid, and not adherent to the iris; and where the operation has been skilfully performed according to all the preceding principles laid down, accidents and failures are seldom likely to occur; and where they do occur it is to be feared the eye will too frequently be lost, do what we may. If extraction of the cataract cannot be performed successfully, it had better never be attempted; nevertheless, as uniform success belongs to no one, it is proper to give a brief account of the most approved methods of alleviating the different accidents which result either from a wrong selection, from errors on the part of the operator, or from unforeseen circumstances; and here the rules recommended by Dr. Mackenzie correspond so much with my own, that with but few alteration or omissions, I can scarcely do otherwise than transcribe them.

1. The spirting out of the aqueous humour, before the counter-punctuation is effected, is one of the most common accidents during the first period of extraction. The iris, in consequence, loses its support, immediately falls forward, and under the edge of the knife. By raising the handle of the knife, upwards, and pressing with the point of the finger, the iris may retire, when the knife may be carried rapidly across the anterior chamber, and the action be completed; but if the iris does not retire on the pressure of the cornea, the knife must be withdrawn, and either the operation deferred to a future period, or a small probe-pointed knife introduced through the aperture which has been made, pushed gently through the anterior chamber to the nasal edge of the cornea, and

over the end of it an opening made with another knife, so as to allow it to come through, after which the incision is to be finished exactly in the same way as if the sharp-pointed knife only had been employed.

2. When the point of the knife reaches the nasal edge of the cornea, the operator occasionally finds it difficult to bring it through, in which case he may derive advantage from pressing the cornea against the knife with his finger-nail. In other instances, the point of the knife is seen to bend to one side, so that it is impossible to perform the counter-punctuation in the ordinary way. The fault here is in the temper of the instrument. When such an accident does occur, the cornea may be opened on the nasal side with another knife, and the knife which is already across the anterior chamber may be carried through this opening, and the section completed.

3. Too small a section of the cornea is a very frequent occurrence, in consequence of the operator bringing out the knife at too great a distance from the nasal edge, and perhaps considerably above the equator of the cornea. In this case the incision must be enlarged to a semi circle by the aid of Daviel's scissars, which are so bent, that the one pair serves for dividing the temporal side of the right eye and nasal side of the left, and the other pair for the temporal side of the left and nasal side of the right. Rarely will the incision require to be enlarged at both extremities, but upon no account is the operator to proceed to the second and third periods of the extraction if he is conscious that the section of the cornea is less than a semi circle. Loss of vitreous humour, severe pressure on the iris, and destructive inflammation, are the consequences to be dreaded from forcing a large cataract through a small incision. Resting the scissars on the back of the finger which supports the lid, and opening them a little, the one blade is to be passed under the middle of the flap of the cornea into the anterior chamber, the other remaining external to the cornea; the

instrument is then to be carried close to the temporal or nasal edge of the cornea, according to circumstances, and with a single stroke the incision is to be enlarged to the requisite dimensions.

4. When proceeding to the third period of the extraction, the operator should not only satisfy himself that the incision is of sufficient dimensions, but likewise that the capsule has been well divided by the needle, and should there be any impediment to the advance of the lens notwithstanding, by moderating the light, and carefully increasing the pressure on the lower part of the eye-ball, the lens will probably advance, and make its exit in the usual way. Impediment sometimes arises from unnatural adhesion between the lens and the capsule, and is to be remedied in the following manner. The operator is to continue the pressure till the lower edge of the lens appears in view, he is then to introduce a thin sharp curette through the pupil, under and behind the lens, and by the motion of the instrument from right to left, to separate the capsule with the lens enclosed, from the hyaloid membrane. A hook is then to be introduced, and the lens and capsule extracted. This will scarcely be effected without some discharge of vitreous humour, but certainly less risk attends this mode of procedure than that of forcing out the cataract by continued pressure.

5. It sometimes happens that the lens falls in pieces and part remains behind the pupil. In this case, if the operator rubs the eye gently through the medium of the upper lid, and then opens the eye, he will generally find that the fragments have advanced into the anterior chamber. They will readily escape on lifting the flap of the cornea with the curette. But nothing beyond the gentlest efforts should be used, for any small particles which may be left will dissolve in the aqueous humour.

6. An escape of vitreous humour may take place. This is most frequently owing to weakness of the hyaloid membrane from age or from disease. If the escape of

the vitreous humour commences before the lens has been removed, all pressure on the ball of the eye must be immediately discontinued, and a small hook should be introduced to lay hold of the cataract as speedily as possible. The eye is then to be closed, and very gently rubbed through the medium of the upper lid, in order to replace the iris, which is very apt, when there has been any escape of vitreous humour, to protrude through the wound of the cornea. The cornea heals more slowly than usual after this accident, the cicatrix is broader, the pupil not unfrequently destroyed, and vision less perfect. If only a fifth, or even a fourth, of the vitreous humour is lost, vision may not be very materially affected. If a third is lost we cannot calculate on any useful degree of vision. If more than a third is evacuated the pupil generally closes, and the eye-ball becomes permanently atrophic.

If the capsule has been opened by the posterior operation through the sclerotica on a previous occasion, with the view, for example, of softening a hard cataract previously to attempting to divide it, or displacement has been ineffectually performed, and the operator proceeds to extraction, he will almost to a certainty encounter a dissolved hyaloid membrane, and of course an evacuation of vitreous humour.

7. It has already been mentioned, that immediately after the operation, any protrusion of the iris may generally be reduced by rubbing the lid, and suddenly exposing the eye to the light. Slight efforts with the curette may be required, and should this also fail, a small snip may be made in the protruding portion of the iris, when it will often return almost of itself into the eye, in consequence of the draining away of the aqueous humour which was lodged behind it.

The iris often protrudes about the fourth day, from the supervention of inflammation; or sometimes from having made the incision too close to the sclerotica. The edges of the wound are observed to gape, and are somewhat

swollen and everted. The iris soon begins to shew itself between the lips of the wound, and as the aqueous humour accumulates behind it, this staphyloma iridis increases. At the same time, the protruding portion of the iris inflames and is united by effused lymph to the edges of the wound of the cornea. The conjunctiva and sclerotica redden, the discharge of tears is frequent and irritating, the patient feels as if some foreign body of considerable bulk were lodged beneath the eyelids, the eye and supra-orbital region become painful, the skin dry and hot, and the pulse quick. No direct attempt to reduce this protrusion need be made. Snipping it with the scissors, however, can do no harm. Belladonna is not to be used, as calculated to favour the protrusion. The strictest antiphlogistic treatment will be necessary, and the protruding iris should daily be touched with a sharpened pencil of lunar caustic. It is very seldom, however, that the eye will be preserved from the violent inflammation which it suffers. In more fortunate cases, the iris will be more or less drawn towards the cicatrix, and partial or complete closure of the pupil will result, affording often a favourable case for the formation of an artificial pupil.

8. Where the flap of the cornea has been carelessly adjusted, the edge of the wound sometimes unites in so imperfect a manner, as to be unable to withstand the pressure of the aqueous humour. The consequence is, that a thin semi-transparent membrane, having the appearance of a vesicle distended by aqueous humour protrudes, giving rise to the sensation of a foreign body in the eye. If this membrane, which has generally been regarded as the lining membrane of the cornea, be punctured, the tumour formed by it subsides; but speedily re-uniting, it is protruded as before, so that it is better to snip it off close to the original edges of the wound, and keeping the eye closed for several days, endeavour thus to procure a more perfect union. The cicatrix in every such case will be very considerable.

9. Inflammation is the consequence most to be dreaded after the operation of extraction. It is too frequently the result of attempting by force, haste, or undue interference, what ought to be effected by tact and skill.

Where there is acute pain, and the constitutional powers are good, it will be necessary to abstract blood from the arm. All the ordinary means to check inflammatory action must likewise be resorted to, if the symptoms of inflammation continue; excepting two, namely, the use of mercury, so as to effect the system; or the use of nauseating medicines. The one would prevent the union of the section of the cornea, by checking the adhesive process; the other, by occasioning vomiting, might cause the loss of the vitreous humour. We can only, therefore, rely on purgatives, and the general and local abstraction of blood.

When the symptoms of inflammation do not occur until the expiration of thirty or forty hours after the operation, the nature of the inflammation must be ascertained, before any treatment be adopted. The bandage should be removed, and the condition of the eyelid first examined; and, at the same time, the character of the secretion which escapes from between the palpebræ should be ascertained.

If the eyelids be swollen, and of a florid red colour, and be extremely tender to the touch, with a thick yellow secretion upon the cilia, and at the inner canthus, the inflammation is of an acute kind. When the eyelids are separated, which should, if possible, be effected by the natural effort of the muscles, without pressure of the fingers, the conjunctiva will be found red and swollen, or chemosed: no time should then be lost in adopting the treatment just described.

But if the palpebræ, although swollen, be but little discoloured, and appear as if the cellular tissue were partly filled with serum, rather than the vessels distended with blood, and the secretion about the cilia and inner

canthus to be thin and white, or of a light yellow tinge, the inflammation will be sub-acute; and upon the eyelids being separated, the conjunctiva will be found but slightly discoloured, and raised by deposition of serum in the cellular tissue between it and the sclerotic. This condition of the membrane is called *Serous Chemosis*. If a view of the section can be obtained, it will be found but slightly adherent, and the neighbouring portion of the cornea hazy; perhaps, also, a little ill-formed matter may adhere about the surface of the section.

In these cases, the pain and suffering are sometimes as severe as in the former instance: and are, therefore, apt to deceive the surgeon.

In the acute cases, the system soon sympathises; the action of the heart and arteries becomes much increased with general febrile excitement; but in the sub-acute disease the pulse is feeble, although it may be quick; the extremities cold; and, often, a feeling of depression. The sub-acute disease is just as likely to destroy the eye as the acute, unless properly and timely managed.

Mr. Tyrrell was the first to recommend a more judicious and discriminating practice; and I have followed such practice, in giving at first the carbonate of ammonia, combined with opium, if the patient is restless; and, instead of keeping the patient on a very spare diet, I allow him to take freely of good broth, or other nutritious matter, in solution, that he may fancy. I have, several times, allowed patients, under these circumstances, the moderate use of beer, wine, or spirits, whichever they may have been previously in the habit of taking; trusting much more to nutritious diet and ordinary stimuli, than to medicinal stimuli. “By giving,” says Mr. Tyrrell, “eight or ten grains of the carbonate of ammonia in a little mint-water, with or without the opium, as may be thought proper, the surgeon is enabled to judge of the nature of the case more accurately; as, in the sub-acute disease, the patient nearly always experiences

some degree of relief, soon after the dose has been administered ; but, in the acute case, the symptoms become aggravated : I have seen the lids edematous, the conjunctiva with serous chemosis, the section covered with ill-formed matter, the cornea hazy, and the patient suffering from acute pain ; and, after eight and forty hours from the commencement of the treatment I have just described, all these parts have re-assumed their natural characters, and the section of the cornea has been firmly adherent.

Modification of extraction through the cornea.—There are certain cases in which a section of only one-third of the circumference of the cornea is not without its advantages, either rupturing the capsule through the cornea some days previously, or just before making the section. I have myself occasionally done so with success, but on the whole these operations had better be confined to arid *siliquose cataracts*, to those instances either of attachment of the iris to the lens, or where, on attempting to cut up a lens, it is found too hard ; or, in depressing it, rolls round the needle, or has accidentally fallen into the anterior chamber, in which latter the operator had better transfix the lens, and, entrusting the needle to a steady assistant, accomplish the section of the cornea, piercing the lens and cornea together with the extraction knife.

Such operations are easily accomplished by an experienced hand. A hook, or a small pair of forceps, is required for seizing the cataract, and sometimes a pair of sharp iris scissars. Mr. Travers and others recommend, even for soft cataracts, a *quarter section* of the cornea, dipping the point of the knife into the capsule. The exit of the fluid cataract may be aided by the curette.

SECT. III.—THE OPERATION OF RECLINATION OR DEPRESSION.

It is no difficult matter to remove the opaque crystalline from the axis of vision, and place it at the bottom of the vitreous humour ; but it requires exceeding nicety

and practical tact so to do it as to avoid the many injuries and subsequent inconveniences which especially appertain to this apparently simple operation ;—the chief of these are, injury to the ciliary processes and iris, the pressure of the lens on the retina or iris, the rising up of the lens after operation, and the occurrence of secondary capsular cataract.

The operation of displacement, like that for extraction, is applicable to cases of hard cataract, and may be selected in preference to extraction when from diminution of the anterior chamber, adhesions of the iris, a morbid state of the pupil, and the temper of the patient, extraction cannot be attempted ; or where the globe is deeply seated in the orbit, the palpebral aperture much contracted, the patient extremely feeble, or subject to chronic cough or asthma.

The patient should be brought, as near as possible, to the same condition as when about to undergo the operation of extraction. In ordinary cases, he should have lived abstemiously for three or four days, and a mild laxative should be administered the night previous ; a dose of morphia or of Dover's powder is given an hour before operating.

The pupil should be fully dilated by the belladonna, in order that the surgeon may have a clear view of the direction of the needle and the lens as he proceeds with the operation. This is of still further importance, as the iris will be less endangered from any accidental or incautious movements of the needle.

The patient, having the opposite eye covered, is seated on a low chair, in front of, and near to a north window, in order that clear light may be obtained. His head is supported on the breast of an intelligent assistant standing behind. The upper eyelid is raised by the assistant's fore and middle fingers of the left or right hand, applied in contact, without pressing on the globe, and the other hand is placed under the patient's chin, to steady the head.

The surgeon is seated in front of the patient, on a chair

somewhat more elevated than the patient, with his foot supported on a stool, and resting his elbow upon his knee, upon which is placed a cushion.

The curved needle of Scarpa (fig. 8), or the lance-shaped needle (fig. 10), well oiled and wiped, is introduced a line and a half from the junction of the cornea with the sclerotica, and about a line below the equator of the eye, towards the external canthus, with one flat surface looking upwards and the other downwards, in order that in passing through the pars non-plicata of the corpus ciliare it may wound as few of the choroidal arteries as possible. The needle is to be held in a light and delicate manner between the fingers and thumb.

The point of the instrument should be directed at first towards the centre of the vitreous body to the extent of about four lines; the cells of this body are to be broken up, so as to afford a passage to the lens; this is effected by inclining the needle cautiously downwards, backwards, and outwards: the needle is then carried, with its convexity looking towards the iris, under the inferior edge of the lens, and brought into the anterior chamber; a half turn should now be given to the instrument in order to ascertain that it is free of the capsule; the point is then to be turned backwards, and the anterior part of the capsule is to be broken up near the ciliary processes, by carrying the point of the needle first in a circular direction around the periphery of the lens, and then by a crucial incision of the centre; I consider the above method the most effectual way of avoiding secondary capsular cataract.

The point of the needle is now placed on the upper and anterior part of the lens, and by raising the handle and pushing the point slightly forwards towards the inner part of the eye, the lens is removed from the axis of vision, and the relative situation of its surfaces changed, its anterior surface becoming the upper. The needle is allowed to remain in contact with the depressed lens for a few seconds;

this done, it is to be rotated between the finger and thumb (so as to disentangle its point from the lens), and is then steadily raised to the pupil; if the cataract remains depressed, the instrument is now carefully withdrawn in a direction inversely to that of its introduction.

The following rules are to be strictly attended to:—

1. In puncturing the coats of the eye, the point of the needle is to be directed towards the centre of the vitreous humour, thus completely avoiding the lens.

2. The instrument is to be introduced at a distance *not less* than a line and a half from the cornea; if this rule is not attended to, the ciliary processes will be endangered. Authors recommend that the puncture should not be further distant than two lines from the cornea, in order to avoid injuring the retina, but this is inevitable at whatever distance we penetrate the sclerotic coat.

3. In order to avoid the long ciliary artery, the instrument is to enter about a line below the transverse diameter of the eye.

4. As soon as the needle has penetrated to the extent of one-fifth of an inch, the instrument is on no account to be thrust deeper into the vitreous humour.

5. In depressing the cataract, the needle must not descend below the inferior edge of the dilated pupil, or else the cataract will be pressed through the retina, “and vision will be destroyed by the very attempt which we make to restore it.”

6. For the space of a minute or two the needle is to be kept in contact with the depressed lens, and should it rise, the depression must be repeated in the most cautious manner.

7. The tearing up of the capsule is most important, and this can only be properly done by commencing at its circumference. If the centre is first penetrated, it would then be difficult to detach the edges and prevent the formation of a secondary capsular cataract, one of the most annoying sequelæ of this operation. The best plan

would undoubtedly be to depress the lens with its capsule entire, but I know of no means of effecting this, not excepting even the use of a blunt needle. Where the lens does descend enveloped in its capsule, I think it is more apt to rise again, and is certainly less likely to diminish in size by absorption.

8. It is not sufficient to depress the lens by seizing it with the point of the needle. The entire face of the needle ought to press on the lens from the internal to the external side of the pupil, otherwise it would rotate on its axis and escape from the needle, sometimes even escaping into the anterior chamber. Where this accident occurs, the surgeon must endeavour to harpoon the lens and then depress it, or, if this should fail, he has no alternative but to remove the cataract by an incision of the cornea.

Modifications of the above operation according to varieties of cataract.—1. When the cataract is found to be friable or soft, the operation of division must be substituted by carefully lacerating the anterior hemisphere of the capsule, and the needle withdrawn.

2. It not unfrequently occurs in capsulo-lenticular cataracts, that on penetrating the capsule, the fluid portion of the lens bursts into the aqueous humour like a cloud, obscuring for a few moments the operation. This soon subsides, and if there is a central nucleus it is soon perceived, and the operation of depression may then be proceeded in.

3. Cases occasionally occur of adhesion of the capsule to the edge of the pupil. In these instances, we must endeavour, as much as possible, with the point and edge of the needle, to detach and cut up the capsule. The lens is to be displaced or divided, as its consistence may indicate.

4. Instances not unfrequently happen in which the cataract repeatedly rises up, whenever the depressing movement is discontinued. Such an occurrence has been

ascribed to a greater degree of adhesion than natural between the crystalline capsule and the membrane of the vitreous humour, and has been designated *elastic cataract*. In such a case, we allow the cataract to resume the situation whence it had been forced by the application of the needle; we then carry the instrument over the upper edge of the lens and down behind the posterior hemisphere of the capsule; we move it upwards and downwards, so as to destroy the adhesion of the capsule to the hyaloid membrane, bringing up the needle from under the cataract into the posterior chamber, and then repeat the displacement as before.

After treatment.—The eyes are to be shaded by means of soft carded cotton fixed by a roller passed round the head, or pinned to the night cap.

2. The food is to be light, and such as requires no mastication. The patient should be kept in bed or on a couch, in a moderately dark apartment.

3. After three or four days the eye may be protected from the light by a green shade, but ought not to be employed in examining objects for eight or ten days. After this period the eye may be gradually brought into use.

The injurious consequences of this operation arise chiefly from breaking up of the delicate texture, which fills the globe, or from pressure on the retina. Congestion of vessels, turbid humours, flaccid tunics, and palsied iris too often result. Acute inflammation must follow any unskilful movements of the needle. Slight hæmorrhage into the chambers will be absorbed.

SECT. IV.—DIVISION (FOR SOLUTION OF THE LENS) THROUGH THE SCLEROTICA.

This operation is only applicable to soft cataracts. The object is to submit the soft opaque crystalline to solution in the aqueous humours, and ultimate absorption. The pupil is to be dilated in the usual manner by the application of the atropine or belladonna. The needle is

introduced in the same situation as for depression (fig. 8), only the needle is shorter, and its cutting edges extend rather further from the point as represented in fig. 9. *15 plate 4* The edges of the needle should be very sharp; and its point must be directed towards the anterior surface of the crystalline, as for depression. The entire of the central portion of the capsule must be freely lacerated to rather more than the natural diameter of the pupil. If the cataract be fluid, its contents will pass into the anterior chamber, and render the aqueous humour turbid; but if it should be only soft, the needle is merely gently moved once or twice through the lens, and having lacerated the capsule, the instrument is to be withdrawn. The absorption of the lens goes on to a certain extent; we find probably that some of its exterior substance passes through the opening in the capsule into the anterior chamber, and is then completely absorbed.

By cautious proceeding, this operation may be several times repeated. In many of these cases, in which the greater part of the lens is soft, the nucleus remains firm and the size of this firmer nucleus will very much influence the time required for its absorption. Particular care should be taken not to displace the lens by the first operation, otherwise it will bulge against the iris and occasion considerable irritation.

The aqueous menstruum being secreted chiefly in the posterior chamber, it is not necessary that the lens or capsule should be advanced into the anterior chamber. Monsieur de la Garde is of opinion that the removal of the opaque lens, after the capsule is opened up by the needle, is to be attributed as much to the action of the absorbents of the lens itself stimulated by the pressure of the aqueous humour, as to the operation of the solvent effect of this fluid.

The cases to which this operation is adapted, are all congenital cataracts, in early life especially, and every instance of fluid or soft cataract. It is also applicable to

caseous cataracts. The time required for absorption is uncertain; the less inflammation is excited, the more rapidly does the process advance. Inflammation, indeed, seems to be incompatible with absorption, which is explained, partly by the well-known fact that over-distention of the blood vessels is always found to be inconsistent with a free action of the absorbents, and partly by this, that even although there may be no evident effusion of lymph behind the pupil, there is always a disposition in internal ophthalmia to such an effusion, and of course a tendency to close up and repair the injured capsule.

SECT. V. — THE OPERATION OF DIVISION
THROUGH THE CORNEA (THE KERA-
TONYXIS)—

Has the merit of simplicity and safety (figs. 11 and 12). There is no operation which can be accomplished with greater facility; and it may be repeated frequently with little or no pain, and seldom requires the patient to be confined for more than two or three days. The needle ought to be considerably smaller than that used for division through the sclerotica, as it has to operate through the pupil, and often in the eyes of infants. The edge of the needle must be very sharp, the neck round, and of such a degree of increasing thickness as shall fill the wound made by the bent or lance-shaped part of the instrument, and so prevent the aqueous humour from escaping. The needle is introduced through the cornea, and the capsule and cataract broken up, the pupil is previously dilated by the atropine or belladonna, and the dilatation ought to be continued for some time afterwards. The puncture may be made in any part of the conical circumference; it soon heals and leaves no cicatrix. The operation can be performed with so little disturbance to the organ, that I am exceedingly partial to it in all cases where the cataract is soft or fluid, or where its consistence is at all doubtful. In fluid cataracts I use a sharp flat

needle, and purposely allow the aqueous humour to escape, whilst I am performing a rotatory or drilling movement of the needle; by this means the fluid and flocculent portions of the lens burst forward into the anterior chamber to supply the place of the aqueous humour; and as the aqueous humour is re-secreted on the following day, these soft and fluid portions of lens soon undergo solution and absorption in the aqueous chamber. Mr. Tyrrell has termed this modification of the Keratonyxis, "the operation of drilling," and recommends great care to be observed in all cases of avoiding the escape of the aqueous humour; but I rather consider the temporary loss of this fluid as an advantage. Under all circumstances I prefer this operation, not only in soft cataracts, with or without opacity of the capsule, but I consider it the best and safest operation in the congenital form of cataracts, and in cases of capsular cataracts, the result of inflammation involving the iris and anterior portion of the capsule, with adherence of the former to the latter, whether the lens has preserved its transparency or has become opaque. Indeed, I have seen so many instances of sight restored by this simple operation, where the pupil has been closed by plastic exudation to the capsule, that the operation may be considered as one for artificial pupil, which I shall subsequently notice under that head.

SECT. VI.—CONGENITAL CATARACTS.

The cataracts of infants are always soft, and it usually happens that the capsule is opaque as well as the lens; indeed, where congenital cataracts have been suffered to remain for years without any attempt to cure them, we generally find that the lens is partially or entirely absorbed, and that the capsule has a white shining shrivelled appearance. Such cataracts are only to be operated on with the needle, so as to lacerate the capsule, and reduce the lens to fragments; this may be accom-

plished either by the anterior or the posterior operation, but I prefer the former for the reasons already stated. The great difficulty is in the fixing the head and denuding the eye, so as to get a clear view of the organ; the fissure of the lids being small, offers a considerable obstacle to a free exposure of the organ.

The child must be placed in the recumbent position, with the head upon a pillow, and a sheet should be rolled round the body, so as better to secure the arms of the patient. We can seldom succeed in opening the lids sufficiently without the use of the elevator of Pellier, by which the superior lid is to be fixed against the orbit. No pressure whatever is to be made on the ball of the eye. More than one operation is generally required. The first causes the solution and absorption of the lens, if that is still remaining, and the next operation is with a view to get rid of the capsule; the mode of treating the latter is the same in the infant as in the adult; the needle is to be carried in front of the capsule; and its surrounding connections are to be detached to its circumference. When thus detached, it rises up after the needle is removed, and seems to fill the pupil as before; but it shrinks when no longer connected at its circumference, and is gradually withdrawn below the lower edge of the pupil.

The *after treatment*, must be regulated on the same principles which are applicable to the other operations.

SECT. VII.—SECONDARY CATARACTS

Consist of such opacities of the capsule as appear after the removal of the lens, by whatever method that may have been attempted; or a portion of opaque lens may remain in the pupil after either of these operations. Such lenticular fragments will gradually disappear by solution and absorption. If these are large the pupil may be kept under the influence of belladonna. Any opaque capsule which may remain, or which may form

subsequently to operations for cataract, must be treated on the principles already described, as applicable to capsular cataracts. Secondary cataracts may also be the result of inflammation of the iris and the consequent effusion of lymph. These are to be remedied by an operation for the formation of an artificial pupil, or by the method before alluded to for treating capsular cataract. Secondary capsular cataracts are exceedingly tough and elastic, almost cartilaginous; and their specific gravity being lighter than the aqueous humour, or vitreous fluid, it is impossible to depress them. Such cataracts ought to be divided by the point of the needle at their lower portion, in order that any remaining shreds which continue attached to the circumference of the capsule, may float out of the axis of vision. Sometimes these cataracts may be got rid of by transfixing them at the external edge, and carrying the needle across, by endeavouring to tear the cataract by a rotatory movement of the needle. A curved needle is the best adapted for this purpose, which cannot be too sharp; and the posterior operation will be the best, as affording facility in cutting and twisting the capsule. But the most satisfactory method of removing secondary capsular cataract is by a section of the cornea, and extraction of the cataract by a hook. Fig. 13 is the instrument I recommend for this purpose, though, like many other "inventions," I find it has been claimed by others. An incision being made of about a quarter of the circumference of the cornea, by means of a lancet or cornea knife, the forceps, which resembles those of Aassalini for tying arteries, is introduced, and the opaque capsule seized and extracted.

SECT. VIII.—ON THE COMPOUND OPERATION OF SOLUTION AND DEPRESSION, OR SOLUTION AND EXTRACTION.

It may be safely asserted, that the more experienced the surgeon becomes, the more cautious is he in operating

on so delicate an organ as the eye. There are men of sound practical knowledge and vast experience, who have recommended and adopted such cautious practice. I am inclined to attach some importance to these compound operations, advocated by Messrs. Tyrrell and Jeaffreson. It is only to be regretted that they cannot be more frequently adopted. Patients have not sufficient resignation to submit to the long confinement which these repeated operations require. The friends become impatient, and are not satisfied with the slow progress. Nevertheless, there are instances in which such a procedure is to be preferred, especially cases of cataract in which the bulk of the diseased body is principally hard, for which the operation of extraction cannot be safely adopted; because the cataract is so large as to press forward the iris, and render the anterior chamber too small to allow of the passage of the knife, to accomplish the section of the cornea; but in which no other circumstance would forbid the operation.

The plan is to make a small perforation in the centre of the anterior capsule of the cataract, the pupil being previously dilated by the atropine. The patient is to be kept perfectly quiet, on low diet, and the iris is to be continued under the influence of the belladonna. The lens must not be disturbed from its situation, for which purpose the needle must not be used with too much freedom. The result is, that the lens becomes diminished in volume, the iris recedes, and the anterior chamber proportionately increases in dimensions. When the lens has thus become diminished in volume, by one, or even a second similar operation, and all irritation has subsided, the patient will generally be found in a favourable state to undergo the operation for extraction. One caution, however, is essential, *viz.*, the capsule of the lens having been opened, and some part of the anterior attachment of that body having been destroyed, the operator should be especially careful not to make

pressure on the globe of the eye on completing the sections of the cornea.

In these cases of large cataract, the outer layers are so soft as to be readily acted upon by the aqueous humour, and the tranquil state to which the system is brought, and the further opportunities which the surgeon obtains of ascertaining any irritability or peculiarity of the patient, are not the least important points in favour of the above method.

These cases are equally favourable for depression, inasmuch as a body of smaller dimensions is less likely to press on the retina or iris, and, as a hardened nucleus is less likely, from its specific gravity, to rise again, after the operation of depression.

The mode which Mr. Jeaffreson recommends, is that of endeavouring to cut up the anterior portions of the lens and capsule, by means of a sharp needle, having a double cutting edge, introduced through the sclerotic, as in the usual posterior operation for depression. After the outer laminae are divided, and the capsule freely lacerated, the lens is to be slightly depressed, so as to admit the rays of light through the upper portion of the pupillary opening; but the lens is not to be removed out of the axis of vision. If the cataract is of the softer kind, "it of course yields to the needle, and the operation then becomes simply that for solution; if it is so hard that it cannot be cut up, the capsule, at least, is freely lacerated, and then the point of the needle being raised, is made very gently to press the lens downwards, to the extent of a few lines only, and just so much as to admit of a few rays of light." It generally happens that some portion of the cataract is divided: the needle being held for a few seconds over the cataract, is carefully withdrawn. The iris is to be kept under the influence of belladonna for the purpose of freely admitting the access of the aqueous humour to the lacerated lens. When all irritation from this operation has subsided, and a nucleus of

hardened lens only remains, this may be further depressed by a second operation. The *rationale* of the above practice is, therefore, such a laceration of the anterior surface of the capsule, as to admit a free access of the aqueous humour to the lens. The depression is, of course, far too slight to risk the falling of the lens on the retina, but is sufficient “partially to break through its attachment to the vitreous humour, and its hyaloid membrane, by which some of its sources of nourishment being cut off, as in the operation for couching, it tends gradually to dwindle away. Be this, however, as it may, whether partly from this source, and partly from the partial absorption of the lens, and the escape of the Morgagnian fluid, or entirely from the absorption of a portion of the lens, or that the lens thus partially detached, falls gradually a little lower from the effect of specific gravity, certain it is that the opening for light which was, at first, of but a few lines, gradually increases until there is sufficient space left open to admit of very useful vision. This is, however, supposing the least successful result of the operation; and if, after the lapse of some time, the benefit obtained should appear insufficient, nothing can be easier than to have recourse to the operation again, and it will rarely, indeed, be found that a repetition of these means fails to effect as perfect a cure as the most successful operation by extraction.” It has not often occurred to Mr. Jeaffreson to find it necessary to repeat the operation; a circumstance which he attributes mainly to the great care and pains he always takes most freely to lacerate the capsule; and “no one who has not repeatedly had recourse to this operation, would imagine how hard a cataract may become in great part absorbed by the continued and free access of the aqueous humour to its structure; so that a first operation is very frequently successful beyond all expectation.”

“In comparing this with the other modes of operating, the first advantage which it presents is its almost universal

applicability.” The danger of pressure of the lens on the retina is certainly avoided. The operation is gentle, and, when carefully performed under skilful hands, ought not to inflict any serious injury on the organ. The cells of the vitreous humour are not broken down; and the ciliary processes are not much injured; the iris ought not to be injured at all; consequently, there ought not to be much risk of inflammation; and, whilst in extraction or depression, “a failure of either is followed by irrecoverable blindness, such an unfortunate result can rarely, if ever, occur in the operation now under consideration. The worst that can happen being a necessity for its repetition.”

One circumstance would appear favourable to the success of all these compound operations, *viz.*, the gradual restoration of vision, by which those risks are avoided which are due to the sudden and full flash of light which is admitted to the retina in the operations of couching and extraction.

There is one great merit attached to these operations, where little injury and risk is incurred, *viz.*, that they can be performed by the most inexperienced. The operation of extraction, when skilfully performed, is, indeed, so brilliant, that it cannot be superseded, but how few are the surgeons who possess the requisite skill and dexterity; how few can acquire the necessary experience to perform it with confidence, and certainty! Where this confidence is wanting, the compound operations are the safest, and deserving of more universal adoption by those who have but little opportunity of operating on the eye.

SECT. IX.—COMPARATIVE MERITS OF THE SEVERAL OPERATIONS FOR CATARACT.

Much has been written on this subject. Professor Velpeau has endeavoured to give an elaborate, and im-

partial review of the comparative merits of extraction and depression, but it would seem that accurate statistical records are still wanting on this much debated question. In the Parisian hospitals, the operations by extraction are not so successful, by one-half, as those by couching. "Of three hundred and six cases of extraction at la Charité," says Dr. Littell, "the cures were in proportion of two and a-half to one, whilst of an equal number depressed by Dupuytren, at the Hôtel Dieu, they were more than five to one. Of seventy operations by extraction, forty-three by displacement, and twenty-one by keratonyxis (the operation by solution), performed at the institution last mentioned, between the years 1806 and 1810, the successful cases were, respectively, nineteen, twenty-four, and seventeen, affording a most unfavourable view of extraction, and a great superiority in favour of solution. The operation by solution, however, may be fairly excluded from the argument, for it is only adapted to a peculiar class, *viz.*, to soft cataracts, which every practical operator knows are very successfully treated. The comparison, to be of any value, must be confined to extraction and depression. Great, however, as has been the mass of evidence accumulated by the professor of la Charité, still, I think, we require a more accurate statistical report. We ought to have an equal number of cases for each operation, faithfully recorded by men of equal skill, of equal veracity, and of equally patient inquiry. Let fifty cases be submitted to extraction, fifty to reclination, fifty to the compound operation of solution and extraction, fifty to the compound operation of solution and depression, fifty to the operation of lacerating the capsule and outer laminæ of the lens with partial depression, as practised by Mr. Jeaffreson, and fifty be submitted to depression of the lens *in* its capsule, by means of a blunt flat instrument, such as has been recommended by Mr. Raleigh, as an improvement on the Indian method of couching. Let the constitution,

the age, the previous history of the patient, be accurately recorded; whether ever subject to gout or rheumatism, &c., the treatment before and after operation, the comforts of the patient, and the precautions used, and especially the season of the year and the state of the weather. We might thus arrive at more certain conclusions, with one proviso, *viz.*, that the result of the cases of depression should be noted for a longer period than any of the others; as it is, this operation which, *par excellence*, is generally believed to fail ultimately, by slow and insidious morbid changes, even although sight may be at first restored.

The English surgeons generally give the preference to extraction; so do most of the German professors. But may not a greater success attend their practice, from the undivided attention which they have an opportunity of giving to the particular operation, in hospitals especially devoted to ophthalmic practice? In Paris there is no special clinique of ophthalmic surgery, excepting a small ophthalmic institution, established by Dr. Sichél. In the French metropolis, there are more surgeons who practice depression than extraction. In India, in the healthy and robust natives of the Western provinces, I have found extraction the most successful; whilst in the lower provinces of Bengal, where the inhabitants are more feeble, I have not found extraction so successful; but, at the same time, it must be admitted that we have not many opportunities of watching the result for a long period after operation.

The argument as it at present stands, as a question of general statistics, is beset with difficulties. The operator who has chosen one method becomes prejudiced in favour of that method, and he is too frequently unfit to judge of the opposite method. "The results likewise," says Professor Velpeau, "announced by different men, equally instructed, are nevertheless by no means decisive arguments." The success which attended depression in the hands of Dupuytren, by no means proves that this surgeon

would have been less fortunate if he had directed the energies of his mind with equal zeal to the operation of extraction. “En faisant connaître que, par extraction, Sharp obtint un nombre égal de succès et de revers; que Richter a réussi sept fois sur dix, Pelletau et Dupuytren vingt fois sur cinquante, M. J. Cloquet vingt-huit fois sur quatre-vingt, M. Roux cent quatre vingt-huit fois sur trois cent six, A. Pamard trois cent deux fois sur trois cent cinquante-neuf, on ne prouve pas plus pour ou contre cette méthode, qu’on ne démontre la prééminence ou l’infériorité de l’abaissement, en disant que, de cette manière, Beer, Weller, M. Roux, ont été malheureux dans plus de la moitié des cas, tandis que Dupuytren cite cinq réussites sur six, M. J. Cloquet quatre-vingt dix-sept sur cent soixante-six, M. Bowen cent cinquante-quatre sur cent soixante (!) et M. Lusardi quatre mille cent soixante-huit sur cinq mille trente-quatre (!).”

M. Robertson has taken the pains to analyze the reports of twelve different authors on 1,307 cases of extraction, of which it appears 397 have failed; whilst 104 only have been unsuccessful out of 7,529 by depression. But I must presume to doubt the accuracy of the information collected by that gentleman. To shew how fallacious this kind of proof is, “let,” says M. Velpeau, “twenty of the most able surgeons of Europe only operate by extraction, whilst twenty others, taken at hazard, have recourse only to depression. Does it necessarily follow, because the practice of the former furnishes a greater proportion of successful cases than the latter, that extraction is therefore preferable to depression?”

The following considerations of the advantages and disadvantages of each method, may lead to some more satisfactory conclusions.

By extraction, the obstacle to vision is entirely removed. It is not usually painful, is seldom followed by internal inflammation, neither the ciliary nerves nor the ciliary vessels are wounded, the whole of the interior of the eye

is untouched, the retina, the choroid, the ciliary circle, &c. ; and, lastly, secondary capsular cataract is less liable to follow this than any other operation. On the other hand, the iris may be cut, and the vitreous humour may escape; if the wound of the cornea does not unite by first intention, it may ulcerate, and the iris will prolapse ; inflammation and suppuration of the globe may be the result—at all events, the pupil will become closed.

In depression, purely so called, the vitreous humour does not escape, the cornea preserves its transparency, there is no chance of prolapsus iridis, or of its excision, and the operation may be repeated, if requisite ; but, on the other hand, the evils of the operation are acknowledged by all, and are numerous. The lens acts as a foreign body, and often causes much irritation at the bottom of the eye—it is liable to re-ascend : the operation is frequently followed by membranous cataract, by iritis, deep-seated pain, and general nervous irritation. The needle necessarily penetrates the choroid, the retina, the vitreous humour ; and the ciliary processes are at least somewhat disturbed ; inflammation is as frequent as after extraction. The wound of the sclerotic, the choroid, the retina, and the vitreous body, does not necessarily produce more pain or injury than that of the cornea, when carefully done. With due precautions, it is easy to avoid wounding the nerves and vessels, or the ciliary body. When the capsule of the crystalline is well cut up, there will be less chance of secondary membranous cataract ; in short, much depends on the skill and address of the operator to avoid most of the evils of depression, to prevent the lens rolling round the needle, or falling into the anterior chamber, and to place it flatwise at the bottom of the vitreous humour.

It has been asserted by authors, that the crystalline undergoes absorption in the vitreous humour, and finally disappears ; but this is extremely doubtful. Of twelve *post-mortem* examinations which M. Velpeau has made

one year, two years, two years and a-half, and four years, after the operation for depression, the cataract had only diminished about a-fifth in one instance ; in all the others it had not undergone any sensible alteration. In eleven, the lens had contracted adhesions, by means of some layers of the hyaloid membrane, to a point on the retina and choroid, presenting a sort of knot or cicatrix of about three lines in length. We must consider these results as conclusive, even if they stood alone ; but M. Campaignac and others have fully corroborated them by similar researches.

To sum up the evidence,—if the dangers of extraction are more apparent, and more immediately alarming, those of depression are more numerous and more real. Equally skilful operators will more easily avoid the former than the latter.

SECT. X.—ON THE ADAPTATION OF THE EYE TO DIFFERENT DISTANCES, AND ITS CONDITION WHEN THE LENS IS REMOVED.

As the accommodation of the eye to different distances mainly depends on the mechanism by which the crystalline lens is shifted forwards or backwards, and as the removal of that body necessarily deranges that mechanism, I shall conclude the subject of cataract by a few observations on this peculiar office of the crystalline, and on the imperfect substitute which it is generally requisite to employ for the loss of it.

The most distinguished philosophers have entertained different opinions respecting the method by which the eye adjusts itself to varying distances. Some have ascribed it simply to dilatation and contraction of the pupil ; some to the elongation of the eye, by which the retina is removed from the crystalline lens ; some to the motion of the crystalline lens ; and others to a change in the convexity of the lens, on the notion that it consists of mus-

cular fibres. The second and last suppositions scarcely merit a refutation. The elongation of the eye by muscular compression would occasion an alteration in the curvature of the retina, and consequently the centre of the visible direction, and produce a change of place in the image. To my mind it appears evident that the power of adjustment depends in a great measure on the mechanism which contracts and dilates the pupil, as is exhibited in Fig. 104. *plate 2*

The pupil contracting when the individual is looking on near objects, causes the ciliary bodies attached to the base of the iris to draw the lens forwards, and, *vice versa*, the dilatation of that aperture causes the crystalline to recede and approach therefore nearer to the retina. Dr. Brewster ("Treatise on Optics," and "Edinburgh Journal of Science") is of opinion that this adjustment is effected by two actions, one of which is *voluntary*, depending wholly on the will, and the other *involuntary*, depending on the stimulus of light falling on the retina. But although we must admit the truth of the general doctrine of the power of adjustment depending chiefly on the shifting of the lens, and although I acknowledge its doubly-refracting structure, and that its peculiar texture and gradually increasing density as it approaches its centre enables it to correct the spherical observation of light, yet I must think that the loss of this body is not attended with so great a degree of deficiency with respect to these powers of the organ generally, *provided* the remaining parts of the eye, and especially the transparent media, are in the highest possible state of health. Numerous instances have occurred to myself, where vision has been scarcely inferior, even without glasses, to that which is enjoyed by the best eyes which have never undergone any operation, especially in young subjects, and where there has been the least possible injury consistent with the removal of the diseased lens. I mean particularly in cases of successfully performed division or extraction, where none of the posterior structures have been touched, and a scarcely perceptible

curvilinear cicatrix of the cornea remaining. It is chiefly in displacement of the lens, where the hyaloid membrane is more or less broken up, the ciliary processes wounded, or the retina pressed upon by the depressed lens acting as a foreign body, that such very imperfect vision, or even total loss of it, results. In successful cases we must attribute their distinctness of vision, in a great measure, to the contraction and dilatation of the pupil, and the power of *attention*, and their sight is capable by exercise of very considerable improvement.

It is to provide against the more or less diminished refracting power of the eye that we avail ourselves of the imperfect substitute afforded by artificial convex lenses, or cataract glasses, with which likewise we have the power of occasionally changing the focal distance by shifting the glass forwards or backwards. They ought not, however, to be too hastily employed. So long as the patient's vision is improving by the unaided powers of the eye, so long should he refrain from their employment. The glasses should be doubly convex, of the finest crystal, and of about $2\frac{1}{2}$ -inch focus for reading, or examining minute objects, and $4\frac{1}{2}$ inches for viewing distant objects. The best test of a cataract-glass is, that it enables the person to distinguish objects placed before him at that distance at which he could see them before he became affected with cataract. It is sometimes necessary to select two glasses of different powers, where two eyes are found, after operation, to have different points of vision.

CHAPTER II.

ON ARTIFICIAL PUPIL (κορη μορφω).

PRELIMINARY REMARKS.

SINCE the time of Cheselden*, who first restored vision by the formation of an artificial pupil, accomplishing for that purpose an incision of the iris, a great variety of methods have been invented, all of them being only different modifications of the three following, *viz.*—First, iridotomy, or ceretomy (κορη τεμνω), in which this diaphragm is incised; secondly, iridectomy, or corectomy (κορη εκτομη), in which a portion is excised; and, thirdly, coredialysis (κορη διαλυσις), or detachment of the outer circumference of the iris, from the ciliary ligament. The last operation, which consists in tearing away the iris from its ciliary attachment, is attended with such laceration of the ciliary nerves and bloodvessels at their trunks, and consequent hæmorrhage, and generally severe inflammation, that I think it may be set aside. Scarpa, who proposed the operation, in his “Trettato delle Principale Malattie degli occhi,” now acknowledges another inconvenience, *viz.*—that the iris is apt to resume its position, even in the best case, becoming, as he observes, filiform. Schmidt, Reisinger, Von Graafe, and others, have likewise performed, and variously modified this operation; but it is now generally discarded by the best

* Philosophical Transactions, 1728, vol. xxxv.

surgeons. Experience, the most extensive, in the East, has convinced me that it is worthless. I shall, therefore, confine myself, in the following remarks, to the several modifications of the two first methods, to which I shall add the more modern operation of drilling.

SECT. I.—MORBID CONDITIONS REQUIRING AN ARTIFICIAL PUPIL.

Artificial pupil is required when the pupillary opening is concealed by a leucoma, or when it is itself obliterated. But the morbid conditions which require the formation of an artificial pupil will be more comprehensively described under the following heads:—

1st. *Occlusion of the pupil by an opacity of the cornea.*—The pupillary opening is in its normal condition; but a dense and incurable opacity exists in front of it. The vision is more or less deteriorated according as the obstacle exceeds the periphery of the pupil; and when the patient retains the power of distinguishing objects, he can only look at them by painful efforts, and sidewise. This form is frequently complicated with a central cataract, which can only be detected by examining the eye in profile. This double obscurity of the dioptric media is explained in the following manner:—When the cornea becomes the seat of a central perforating ulceration, the aqueous humour escapes, the iris falls forward, and the lens, in obedience to the contraction of the muscles, advances towards the cornea. The centre of the anterior part of the crystalline capsule comes in contact with, and receives the morbid products of the ulcer, inflames, and becomes opaque. When the ulcer closes, the aqueous humour again fills the two chambers, and the lens resumes its primitive position; but the corneal ulcer has been replaced by a dense white opacity, and a circumscribed opacity likewise occupies the capsule and lens itself.

2nd. *Occlusion of the pupil by a leucoma, accompanied by a synechia anterior.*—In this case sometimes one portion of the pupillary margin is united to the cornea, and the pupil is obscured by the leucoma. Sometimes this last is situated towards the corneal circumference, the pupil being very much narrowed or closed, in consequence of the drawing which the iris suffers by its adherence to the cicatrix. These lesions are generally produced by a perforation of the cornea, either traumatic or ulcerous, which has determined the approximation of the two membranes, and a prolapsus of the iris, after the escape of the aqueous humour. The solution of continuity being cured, the iris remains fixed to the cornea, which was the seat of the wound. The second of these cases is principally observed after the operation for cataract by extraction, when the section has been occupied by a hernia of the iris, which could not be reduced.

3rd. *Occlusion of the pupil by plastic deposition.* (Synizesis, phthisis pupillæ.)—This arises from an inflammation of the iris. The tissue whence the obstruction results, is engendered by an escape of coagulable lymph, mixed, in some instances, with the pus incompletely absorbed, or it becomes combined with the fibrinous residue of a clot of blood. In certain cases, the pupil, strongly contracted in the course of an ophthalmia affecting the interior of the eye, closes in upon itself, so that the divers points of its extent touch each other, and unite with the plastic substance, the presence of which can scarcely be perceived. Occasionally, at the seat of the atresia, a black point is perceived, which resembles an opening, but which is only a layer of pigmentum.

4th. *Occlusion of the pupil by a cataract, complicated with a synechia posterior.*—The operation for the formation of an artificial pupil is indicated, when the margin of the pupil is adherent through the whole of its extent,

or nearly so, to the opaque anterior portion of the capsule. The difficulties of separating such adherence are evident. Scarpa himself acknowledges that depression cannot, in such instances, succeed, and recommends the operation for the formation of an artificial pupil. It should be had recourse to whenever the synechia comprehends more than a third of the pupil. It will be seen in the sequel that these cases are adapted for the operation of *drilling*. The lens itself will generally be found to be fluid, or partially, if not entirely, absorbed.

SECT. II.—PREVIOUS TO UNDERTAKING AN OPERATION,—

1. A careful inquiry must be instituted into the state of the eye, and its generally healthy appearance in every other respect excepting the obstructed vision. The condition of the organ rendering an operation requisite, has always been attended by more or less inflammation, generally of a specific character. This must be carefully inquired into, and the existing state of the patient's health satisfactorily ascertained.

2. That part of the cornea destined to correspond to the artificial pupil ought to be diaphanous. It is also necessary that the region of the iridian diaphragm, on which it is proposed to form the opening, be in a normal condition. An opening formed in a disorganised iris would almost inevitably be closed up by exudation of lymph.

3. It is essential that there should be, at the point where it is proposed to operate, a space, however small, *i. e.*, an anterior chamber.

4. The existence of a total opacity of the crystalline lens does not contra-indicate the operation, but it becomes necessary to practise a second operation, either at the same time, or subsequently.

5. The patient should be able to distinguish between

night and day; whatever may be the density of the obstacle, the individual must be able to recognise so much light as to remove all doubt as to the possible complication of amaurosis. This principle admits of some exceptions. In a patient, for example, labouring under a leucoma, the pupil being free behind the corneal obscurity, the operation would, doubtless, be contra-indicated, where the power of vision had become completely abolished. But if, under the same circumstances, a false membrane also obstructed the pupil, who can say that a soft cataract may not exist behind it, sufficient, of itself, to intercept every ray of light. An operation is, therefore, allowable in these doubtful cases, the surgeon at the same time warning the patient of the slight chance of success. Such is the advice of Graafe, whose efforts have been sometimes crowned with success, although the individuals were entirely insensible to the influence of light.

6. No operation should be performed on one eye where the opposite enjoys the faculty of vision, excepting where it is practicable to form a central pupil, otherwise there would result a want of correspondence in the axis of vision of the two eyes, and, consequently, a general confusion of vision, or a diplopia. Experience has proved, in these cases, that the patient has been compelled to obscure the eye operated upon, and only to employ the other; he has, therefore, lost instead of gained by the operation.

7. When one eye is affected with a simple cataract, and the other with closed pupil, Rosas advises to proceed at first to operate for the cataract, and not to perform artificial pupil, if the patient recovers his sight. It is only when the operation for cataract has failed, that the attempt to form a new pupil should be made.

8. If the patient is too young, coremorphosis should be deferred. It should not be executed before the age of six or seven years.

9. The general condition of the organism, pregnancy, the period of the establishment or cessation of the menses, the existence of an epidemic affection, may require the operation to be delayed. It is prudent, in certain cases, to have recourse to a preparatory treatment, with the view of weakening a prevailing diathesis, and of rendering less probable a fresh invasion of the morbid phenomena which have produced the condition on account of which the operation is undertaken. All attempts should be postponed if there is pain in the eyeball on perception of luminous objects. When the palpebræ are the seat of granulations, of trichiasis, or of any alteration whatsoever likely to oppose the success of the cure or palliate these several lesions before operating.

10. The situation most favourable for the formation of an artificial pupil, is that which approaches nearest to the position of the natural one. It is at the centre of the pupil that the greatest convexity of the cornea exists ; it is, then, on this point that the greatest number of luminous rays ought to fall. Accordingly, when the peculiarities of the malady do not admit of our selecting this advantageous situation, the patients, after the operation, are obliged to have recourse to convex glasses. The internal side of the iris, at the transverse diameter, or under that diameter, is the next best situation ; next in order, the external and inferior external ; the superior portion is the least convenient, on account of the correspondent region of the cornea being ordinarily covered by the upper lid.

If an artificial pupil is to be formed in each eye, some direct us to make the one at the temporal and the other at the nasal edge, alleging that in this way there is a greater degree of correspondence between them than if they were formed in any other situations except in the centre of the eyes. If both pupils are towards the temple, the appearance is far from being natural or agreeable.

CASE.—A young girl, thirteen years of age, presented herself at the Government Ophthalmic Institution in Calcutta, in 1843, with dense opacity of both eyes, and cataracts behind these opacities, the result of purulent ophthalmia during infancy. Vision was totally obscured in the right eye, and there was only a faint lateral perception of light in the left, effected by turning the eye inwards, accompanied by a tremulous motion of the eyeballs. Having made an incision with a lancet in the margin of the cornea, I formed, by excision, a moderate-sized pupil at the inferior and internal portion of the iris; and about a fortnight afterwards I practised a similar operation at the inferior and external portion of the iris of the other eye. The vision was restored in a most satisfactory manner. She walked about without assistance, and she acquired the power over the muscles of the eye, so as to fix her look on objects. Numerous similar cases have occurred in my practice during my career in India, some of which were published in the *Transactions* of the Royal Asiatic Society of Bengal, in an account of a series of cases in which “certain interesting phenomena were manifested in individuals born blind, and in those having no recollection of the sense of vision, on their being restored to sight at various periods of life.”

As an artificial pupil generally possesses no power of contracting or dilating, care must be taken that it be made neither too large nor too small. It is remarkable, indeed, how useful a very small artificial pupil may prove, as is well illustrated in the celebrated instance of M. Sauvages, operated on by Demours. In general, however, so small a pupil does not prove very serviceable; while, on the other hand, an artificial pupil, much above the medium size, exposes the eye to be constantly dazzled, and is thus rendered comparatively useless.

The prognosis of the operation may be deduced from the foregoing considerations. It is favourable when the

pupillary occlusion, the result of a diseased action long since subsided, is the sole cause of the blindness, and the other parts of the globe are sound; when the region of the cornea, which ought to correspond to the new pupil, is in a normal condition; when the patient distinguishes the different gradations of light; when he is in good health, and free from all morbid diathesis. The chances are, in general, better, if we have to deal with a cornea partially diseased, if it be accompanied with a synechia anterior, than when the pupillary orifice is closed in consequence of an affection of the iris. The traumatic lesion involving more particularly this diaphragm, there is reason to fear lest a new inflammation produce, in the recent pupil, effects similar to those produced in the primitive one. The prognosis depends, moreover, on the dimensions afforded for the artificial perforation, and on the method according to which we effect it. We shall see, other things being equal, that it is iridectomy which offers the greatest chance of success. The result is the more uncertain when the cornea only presents a very small diaphanous space; when the iris is discoloured and swollen; when the globe has neither its natural consistence nor dimensions; when there is no impression of light, or but a vague sense of it. It often happens that the surgeon is obliged, notwithstanding a certain number of contra-indications, to yield to the solicitations of the patient, and to attempt an operation which, without ever hurting, when the patient is totally blind, may produce, under certain circumstances, some slight degree of vision. In other cases, sight is re-established in a manner sufficiently perfect for the individual to distinguish small objects. Such a success is rare; the patient ought to think himself happy when he has acquired the power of pursuing occupations which do not require great exertions of sight, and can walk about without a guide.

SECT. III.—METHODS OF OPERATION.

1. *Iridotomy, Iridisection, or Coretomy.*—This method is only applicable where the original opening in the iris has been destroyed, and where the crystalline lens has been lost. This occurs most frequently after the operation of extraction of a cataract, which is followed by a large prolapsus of the iris; but it also results from wound of the cornea, &c., which allows of the escape of the aqueous and crystalline humours, and is also followed by prolapse of the iris. In both these cases, the fibres of the iris are subject to much tension. The cornea is transparent, or there is only a very limited cicatrix near its circumference.

After removal of the lens, by extraction or solution, the pupil closes, in consequence of inflammation of the iris; or the aperture becomes exceedingly contracted, and occupied by a dense and tough adventitious membrane, or capsule, thickened by a fibrous deposit: in this case, also, the fibres of the iris are much on the stretch, which can nearly always be readily ascertained, as the fibres observable on the anterior surface of the membrane pass in straight radii, without any perceptible curve or bend.

The success of an operation for readily forming an artificial pupil, in all these cases, depends upon the fibres of the iris being tense, so that they contract when divided, and, according to Jungken*, we ought first to instil the solution of belladonna, so as to favour this tension of the fibres of the iris.

In operating for division of the iris by incision, I usually place my patient in the same position as for extraction of the cataract, the horizontal, with the patient's head reclining on a pillow. A careful and intelligent assistant should support one or both of the eyelids, in order that the surgeon may have free use of both his hands. The

* "Die Lehre von den Augenoperationen," p. 636.

edge of the iris knife, which is to be introduced through the sclerotica, ought to be exceedingly sharp, and finely pointed. (Pl. 3, fig. 1.)

The surgeon, being seated behind the patient, with the instrument delicately balanced between the finger and thumb, and its edge directed backwards, plunges it into the sclerotica and choroid at the same point as for reclamation, and a short distance into the vitreous humour; the instrument is then directed towards the centre of the iris, and its point protruded through it. The point is distinctly seen as it presses behind the fibres of the iris. He then carries the handle of the instrument forwards, at the same time slightly pushing the point along the anterior chamber, sweeping over the iris, and carefully avoiding to prick the cornea. The iris is now to be divided by a double motion of the instrument to an extent of one-third of its diameter. This will not be accomplished by merely pressing on the iris, nor by one rapid stroke of the edge of the iris scalpel, but by repeated strokes, as though we were dividing fibre after fibre, and by a drawing motion of the knife, as well as pressure with the edge. If the first attempt has not divided the iris to a sufficient extent, the point of the scalpel is to be again carried forwards, and again withdrawn, until the incision is of the proper length. Before finally removing the instrument, we ought to notice whether the artificial pupil expands; and if the edges of the incision do not immediately separate, the pupil may be opened up by touching its edges with the flat side of the instrument. This operation originated with Cheselden, and has been improved upon by Sir William Adams.

Guérin (of Lyons) was one of the first who executed iridotomy through the cornea. "The success of the operation of Cheselden," says he*, "has not encouraged me; I feared to pierce the membrane of the crystalline.

* "Traité sur les Maladies des Yeux, 1769, p. 235."

I prefer, in such circumstances, to make a section of the transparent cornea, and to carry through this way the instrument which cuts the iris. If hæmorrhage occurs, the blood flows through this opening; and being much more master of the instrument, I can easily make a crucial incision, which forms a pupil nearly circular. This method has perfectly succeeded, and I believe that it merits the preference over that of Cheselden."

Flajani introduced through the cornea a needle with a cutting lance, and made in the iris, like Guérin, a crucial incision.

Janin operated on a woman for extraction of the cataract, when the patient, suddenly starting at the moment when the surgeon terminated the incision in the cornea by Daviel's scissars, the iris was vertically cut towards the external angle to the extent of three lines*. This opening remaining, whilst pupils made by the same operator, according to the method of Cheselden, became obliterated, Janin concluded that, to be durable, the wounds of the iris ought to cross the radii of this diaphragm, whilst the sections parallel to these same rays would soon cicatrise. It is upon this consideration that he has founded his procedure of coremorphosis. After having divided the cornea, as for extraction of cataract by keratotomy inferior, this oculist raises the lip of the wound with a curette confided to the left hand, whilst, with very delicate and sharp-curved scissars, which he holds in the right hand, he makes in the iris a long incision of two lines and a half or three lines, at a small distance from the primitive pupil, and most generally towards the great angle of the eye.

The above theory has found a great eulogist in the celebrated Maunoir, (of Geneva,) whose ideas of the organisation of the iris are in all respects analogous to

* Janin, "Mémoires et Observations sur l'Œil," &c., p. 184.

those of Janin. According to Maunoir*, it results from the dispositions of the iris, that it is possible to determine *à priori* the consequences of sections made in it. A wound made across the rays of the dilator muscle will have a variable form, according to the point at which it is situated. If it occupies the middle of the fibres of this muscle, their contraction being uniform, the two borders of the solution of continuity will separate in an equal manner, and a pupil like that of a cat, or of the configuration of a weaver's shuttle, will result. If it exists near the extremity of the fibres of this same muscle, the contraction will be unequal at the two lips; it will be so much the stronger in one or the other of these, as the fibres of the same side are the longest: on the side where they are very short, the contraction will be scarcely appreciable. An incision effected not far from the ligamentum ciliare will furnish, consequently, an orifice, the external border of which will be straight, or nearly so; whilst the border nearest the centre of the iris shall be semicircular: a section established near the sphincter muscle will have an external bent lip, and an internal almost straight.

The operation of Maunoir is performed in the following manner, with a cornea knife, and scissars bent at an angle of about thirty degrees, and having one blunt and one sharp point. An incision is first made to the extent of one-fourth of the circumference of the cornea, close to its edge, and generally towards the temple. If the case is one in which the lens has been previously removed, this incision need not exceed one-fourth; but if we contemplate the removal of a cataract through the artificial pupil, more than one-fourth of the circumference of the cornea should be laid open. The scissars are to be directed through the cornea at the point intended to form

* See his "Première Mémoire sur l'Organisation de l'Iris et l'Opération de la Pupille Artificielle." Paris et Genève, 1812, p. 1 à 7.

the upper part of the incision, and carried across the anterior chamber, and the cornea is to be ripped open to the necessary extent. The instrument is introduced through the opening of the cornea; the sharp point is directed through the iris, and the blunt blade carried before that membrane, as near the edge of the cornea as it is intended to extend the incision. The scissors are now to be sharply closed, and the iris will be divided. Sometimes the pupil is formed by two small cuts in the iris (fig. 4. A B, A C,) united at the acute angle A. The flap thus made retracts, and the lips of the section of the sphincter, the fibres of which have been cut across, separate, leaving a small triangular or quadrilateral opening (fig. 5). The former (as in fig. 2) will be found sufficient where the iris is on the stretch; the latter (fig. 4), when we suspect the substance of the iris to be thickened, or adherent to the capsule. When the closure of the pupil is combined with cataract, the above incisions will lay open the capsule, and may even divide the lens, the fragments of which the operator must endeavour by gentle pressure to bring forward through the artificial pupil into the anterior chamber, whence they are to be extracted, by means of the scoop, if they are soft, or the hook, if hard. It may sometimes be possible to extract even the capsule through the artificial pupil. If a portion of the capsule is firmly adherent to the triangular flap of the iris, it will shrink along with this and form no obstacle to vision. Any fragments of the lens which may remain will gradually dissolve in the aqueous humour.

It is necessary for the performance of these operations that the cornea should be transparent to a considerable extent, and that the anterior chamber should be nearly of its natural dimensions. The instances in which the surgeon has an opportunity of restoring vision by either variety of this operation, are very numerous in India. I have restored some who had been blind for twelve years from simple closure of the pupil, as the sequela of iritis,

as well as cases of synechia anterior supervening on prolapsus from wounds or ulcers of the cornea.

SECT. II.—IRIDECTOMY, OR INCISION,

Is a method which has unquestionably undergone the greatest improvements in this branch of modern surgery, and is applicable to a vast majority of the more complicated and apparently almost hopeless cases of blindness. I shall treat of it under three varieties, premising that practical experience teaches us to simplify as much as possible our mode of procedure, and not, by attempting too much, to endanger a total failure of our efforts.

The first is exceedingly simple, and is that which I have adopted on many occasions. It is adapted to many cases in which the central portion of the cornea is rendered permanently opaque, whether from injury or ulceration, without adherence of the iris to the cornea; and the object is to produce an aperture in the iris immediately under a transparent portion of the cornea, so that the rays of light may pass uninterruptedly to the retina. The second is more immediately applicable to similar cases of dense permanent opacity, in which the iris is more or less adherent to the cornea. The third is only applicable to a few, and those the least favourable cases for any operation whatever.

First method: Iridectomy by puncture of the cornea and prolapsus of the iris.—The instruments which I generally prefer are simply a common bleeding lancet, very sharp at the point, with a piece of waxed thread wound round at a distance from the point, varying according to the extent to which it is intended to puncture the cornea, and a pair of curved scissors.

Let us suppose the left cornea to be obscured over the greater portion of its extent, (fig. 7,) and a small vestige of pupil, insufficient for the accomplishment of vision. It is required to provide a new route to the light, by cutting

out a portion of iris immediately behind the remaining sound transparent portion of cornea, in a direction, if possible, downwards and inwards, or downwards and outwards; but the selection of any particular situation is often not a matter of choice but of necessity, as the pupil must be opposite the transparent part of the cornea, wherever that may be. The manœuvre divides itself into two stages: in the first, the cornea is opened; in the second, the iris is excised.

The patient is seated on a low chair, obliquely towards the light, and the surgeon and assistant assume the ordinary position, as in the operation for cataract. The dorsal faces of the little and ring fingers resting on the cheek, the lancet is plunged into the aqueous chamber at the margin of the cornea, and parallel to the iris, (fig. 7,) and an incision is at once made, to the extent of from two to three lines.

The incision of the cornea is never required to exceed one-third of its circumference, and seldom so much. Introducing the point of the lancet through the edge of the cornea, and as much across the anterior chamber as the state of the parts permits, an incision, of an extent which the operator judges requisite, is effected. If this is done quickly, so as to allow the aqueous humour to issue at once from the eye, removal of the knife will generally be followed by a prolapsus of a portion of the iris. Should no spontaneous prolapsus take place, the iris may often be made to protrude by gently pressing the eye-ball on the opposite side, and at the same time dilating the external opening with the scoop, (fig. 8, A.) Should this measure fail, it will be necessary to introduce a pair of delicately-curved forceps, (fig. 9,) or a double hook, (fig. 10,) with which the edge of the iris is to be seized and cautiously drawn out. In introducing these instruments, great care should be taken to avoid touching the crystalline lens and capsule, which, in cases where we have recourse to this operation, are generally transparent, the

capsule being very nearly in contact with the posterior surface of the iris. The operator now, holding the curved scissars in the opposite hand, excises the protruded portion of iris. Particular care should be taken not to excise too large a portion, a much more serious evil than the excision of too little. Any remaining portion of protruded iris after the excision, is to be pushed back into the anterior chamber by means of a probe. The operator is now to rub the eye rapidly, but gently, through the medium of the upper eyelid, and then to expose it to a tolerably bright light, so as to ascertain the form and size of the newly-formed aperture. Should there be an opacity of the lens, it will be desirable, if possible, to remove that body at the same time that we form the pupil.

The operation being terminated, the pupil presents an extent proportionate to the dimensions of the excised prolapsus. The hæmorrhage is in general but slight, and the blood chiefly flows through the wound in the cornea; an additional advantage, in this respect, resulting from a free and dependent opening. When the pupil is not encumbered by this fluid, the patient can ordinarily distinguish large objects immediately.

The cases to which the operation is best adapted are those where the pupillary edge of the iris is free, or only partially adherent, with considerable opacity of the cornea, leaving merely a transparent portion at any part of its circumference. Fig. 11, is a tolerable representation of a successful case of excision.

The second method of iridectomy, as adapted to dense permanent opacity of the cornea (figs. 12 and 13), with adherence of the pupillary margin of the iris to the corneal cicatrix (synechia anterior). In these cases, the iris will not prolapse on puncturing the cornea. We are indebted to the late Mr. Tyrrell for considerable improvement in this mode of operating. The method of procedure is delicate, and the injury to textures the least which can be inflicted consistently with the object in

view. The requisite instruments are, a broad needle (fig. 15), a fine blunt hook, with a long bend (fig. 16), and the curved scissars. The patient being placed, as in the previous method, the broad needle is carefully introduced through the cornea, close to the junction with the sclerotic, often at that part of its margin which corresponds to the interval between the depressor and abductor muscles. In pressing the needle through the cornea, one flat surface should be parallel to the surface of the iris, and the other, of course, directed forwards; the instrument should be made fairly to penetrate the anterior chamber of the eye, but should be kept quite free of the iris; it should not be passed so far as the pupil. The puncture of the cornea naturally admits of the escape of some portion of the aqueous humour; but if it be carefully made, a very small portion of the fluid only exudes, and it is advantageous to retain such a quantity, that the hook may be carried into the anterior chamber without risk of entanglement in the iris.

The hook should be passed with the bent limb towards the cornea, or forwards; and then it should be carried so far as the aperture of the pupil; and the extremity of the instrument being introduced through the pupillary space, the bent part of the hook should be directed backwards, by half rotating the handle of the instrument between the finger and thumb. If any portion of the pupillary margin of the iris is free, the hook should be directed towards that point, and the iris caught by it, by pressing the point gently towards the surface of the lens, at the same time carefully withdrawing the instrument. Should the iris, on the other hand, be altogether adherent to the cornea along its pupillary margin, a puncture should be made by the point of the broad needle at that part, (*vide* fig. 12), the hook is then substituted, and its point directed towards the artificial opening made in the iris, at its union with the cornea; and the iris, being caught by the instrument, is to be carefully withdrawn (*vide* fig. 13).

When, however, the bent part of the instrument arrives at the opening in the cornea, its exit is liable to be impeded by the posterior edge of that opening; it is necessary, therefore, to half-rotate the handle, so as to direct the bent limb forwards; but in doing this, the instrument must not recede from the opening in the cornea, otherwise the iris might escape from the hook. The hook is then withdrawn with a portion of iris, which is to be excised by the curved scissars. The opening of the iris is necessarily pyriform, the apex being at the corneal opening, and the base at the pupillary margin; but the radiated fibres of the iris, by their contractility, often reduce the opening to a circular or an ovoid form. The great object in this operation is, by delicacy and care, to avoid touching the crystalline, if it is in a normal condition.

The third method of iridectomy that I shall mention (which, indeed, is the only allowable modification of iridodialysis), is applicable where the cornea is the seat of such a dense leucoma as represented at fig. 14, A and B, in which there is a small rim of iris unobscured, sufficient, however, to afford some prospect of success from an excision of a portion of iris close to its attachment to the ciliary ligament. The operation is divisible into three stages:—First, a puncture is effected in the opaque cornea (fig. 14 A), by means of a lancet, or a lance-shaped knife, curved or straight (figs. 18 and 19). The curved instrument is more convenient when operating towards the inner canthus, where a straight instrument would be interfered with by the nose. Secondly, a small sharp hoop (fig. 17) is introduced; and, lastly, a fragment of iris being drawn out, is divided by the curved scissars (fig. 14 B). But let it not be supposed that such an operation, although productive of a clear black pupil, is always followed by the restoration of the faculty of vision. The injury to the highly sensitive structures of the eye is sufficient to account for the amaurotic condition of the

organ, notwithstanding the apparently perfect success of the operation, The ciliary processes likewise necessarily somewhat interrupt the passage of light to the retina, even where the latter has preserved its sensibility.

III.—DRILLING.

The last method of restoring an obliterated pupil is that of "drilling," as it has been termed by Mr. Tyrrell. The cases for which this operation are adapted are those where the cornea is transparent, and where the iris has become adherent to the anterior capsule, as the result of iritis, with or without opacity of the crystalline. Fig. 21 is an example of such a case. I have frequently had occasion to perform this operation, with the happiest results, as a safe and simple one, which may be often repeated. The cornea is wounded by a clean incision with comparative impunity; the wound heals by first intention, without involving the transparency of that structure. The operation is performed in the following manner:—A fine straight needle (fig. 20), very sharp at its point and edges, to the extent of half a line, is introduced through the cornea, near its margin, or anywhere outside the circumference of the most dilated pupil, and carried through the aqueous chamber to the opaque capsule (or to a capsulo-lenticular cataract, where the lens is either soft or fluid). A slight rotatory motion is then effected; and on withdrawing the needle, the aqueous humour escapes, and the shreds of capsule, as well as any flocculent or softer portions of the lens, immediately protrude forward into the anterior chamber; the pupil is preserved in a state of dilatation by the belladonna ointment. Other remaining shreds of capsule retract behind the iris. The sharpness of the needle is adequate to divide the toughest capsules. Such an operation may be repeated twice, thrice, or as often as requisite at inter-

vals of from three to five weeks, with a certainty of ultimate, often of speedy, success, and little or no injury to the visual organ.

After treatment.—I need not insist on the principles which should regulate the after treatment, being such as should guide us in all instances of wounds of such delicate textures, however scientifically performed. The iris should be kept under the influence of belladonna, and should not be used for some days. Should pain supervene, opium ought to be given in small repeated doses, and inflammation must be treated by calomel and opium, venesection, and other antiphlogistic measures. When too large an incision has been formed, so that the eye is dazzled even by moderate light, it is necessary that the patient should shade the eyes, or wear a piece of paste-board or light wood, concave within and convex without, blackened on both sides, and having a central aperture of the form and dimensions of the natural pupil. This will considerably assist his vision in looking at large objects, although he will scarcely be able to distinguish small ones even with the aid of this contrivance. Where the eye, subjected to operation for artificial pupil, has been deprived of the lens, the patient will require the use of cataract glasses.

SECT. IV.—CONCLUDING OBSERVATIONS.

It has been observed, in the preceding rules, that simplicity in instruments, and not the attempting too much at a time, form the secret of success in all cases of operation for artificial pupil.

If, notwithstanding every precaution, the capsule and crystalline are wounded, the opacity will soon become visible through the new pupil. It will be necessary, in such cases, to restore the usefulness of the newly-formed pupil, by breaking up the capsule, and exposing the lens

itself, which is either soft or fluid, to solution in the aqueous chamber, by the operation of drilling.

Where blood is effused into the aqueous chambers, it will either escape by the corneal incision, if that is large, or will most probably become absorbed. Should it form a coagulum which does not readily become absorbed, it may be requisite to puncture the cornea, and extract the coagulum, by means of the cuvette, or a pair of delicate forceps. Chelius states, that he has witnessed the root of the polygala senega "*trionpher complètement, en quelques jours, d'un épanchement sanguin survenu par suite d'une iridodialyse, et qui existait depuis trois mois.*"

Artificial pupils are usually divested of all power of contractility to the action of light, especially those situated at the ciliary margin; but pupils formed by a hollowing out of the natural pupil are possessed of some degree of power of contractility.

The eyeball preserves its natural direction whenever the perforation has been practised in the centre of the iris; but a degree of strabismus always ensues whenever the opening occupies any other part; and it has been suggested by Mons. Florent Cunier, a Belgian oculist, to perform the operation of myotomy, so as to produce an artificial squint, and thus to bring the remaining diaphanous portion of the cornea and the newly-formed pupil more towards the natural axis of vision. For this purpose he divided the external or the internal rectus muscle, according as the artificial pupil were situated, more towards the external or the internal angle of the palpebral opening.

I shall only further allude to a method which has been proposed, of forming an artificial pupil by excising a portion of the sclerotic coat, in cases where an immense leucoma obscures the entire cornea. The author, Autenreith, commenced by detaching a portion of the conjunctiva near the cornea, and towards the outer or inner angle of the eye; then, having detached a triangular

portion of the sclerotic and its subjacent coats, he replaced the conjunctiva. But, as Mons. Velpeau justly observes—
“Le mieux qu’on puisse faire en faveur d’une pareille idée, est de n’en pas parler, et je m’étonne que Beer, Himly, Muller, Guthrie, Ammon, et Ulman, aient pris la peine de l’expérimenter.”

CHAPTER III.

ON THE OPERATION FOR STRABISMUS.

INTRODUCTORY REMARKS.

1. It is curious to trace the history of an operation. Stromeyer has undoubtedly the merit of suggesting, as Dieffenbach deserves that of first practising, this branch of tenotomy; but the germ of the idea may have been the following accident, which occurred to a Dr. Carron du Villards:—"En 1838, un homme (à qui il donnait des soins pour une violente ophthalmie), après qu'il eut reçu à la face un coup de fusil chargé à plomb, fut délivré par là d'un strabisme convergent de l'œil droit, qui datait de son enfance. Le globe était très proéminent, et enchassé dans une énorme bourrelet chémosique, dont l'incision donna issue à une grande quantité de sang. Le plomb (says M. du Villards) avait coupé quelques fibres des muscles obliques, donc la contracture brillait l'œil en dedans*." Was it not rather the "incision" which occasioned the division of the internal rectus muscle? No shot could have cut clean through the rectus internus muscle; and if it had, as Dr. du Villards says, divided a "few fibres" of the superior and inferior oblique, *that* would not have cured the squint. But it is very possible,

* Gazette Médicale, tome vi. pp. 611, 612. (1833.)

the incision made into the chemosed swelling (bourrelet) would have severed the internal rectus.

The success of this comparatively simple operation has been much vaunted, yet frequent observation convinces me it is not always successful. The reason of failure is sometimes owing to the superior and inferior fibres which coalesce with the superior and inferior recti not having been completely divided; and sometimes it is owing to inflammation and deposition of lymph, and subsequent contraction. According to my experience, the operation may be performed with almost invariable success. I shall therefore, from my own practice in India and in Europe, and from the methods of performing the operation, which I have witnessed on the Continent, presume to offer a few suggestions, which will not, I trust, appear unworthy of attention. I believe the following rules to be of importance:—1st. To use always the scissars in preference to the knife and director, because by the former you can more readily divide every contiguous fibre both above and below. To the practised hand, the point of the scissars grates along the hard fibrous sclerotic coat, and the operator is quite certain that he cuts every muscular fibre. Secondly, never to use the hook to claw out the eye, which has always appeared to me, to say the least, an unsightly instrument, and somewhat painful, but chiefly because it must be entrusted to the hands of an assistant, who, unless he possesses the delicate touch of an artist, and the steadiest hand, may rotate the eye not precisely in the horizontal line. If he gives the instrument the least obliquity, he disconcerts the operator in his search after the muscle which he has to divide, and he finds it either above or below where he expects it. Thirdly, the operator should have the lids and eyeball completely under his command; and this is effectually attained by the use of the speculum of Velpeau. The ordinary speculum often slips, and confuses, or obscures, the operation; so do the fingers. This cannot be the case with the speculum of

the Professor of La Charité. I have always operated with the scissars, and I have never met with an instance of the return of the squint; but I have never seen the inconveniences of that part of the duty which devolves on the assistants so happily obviated as by the mode I witnessed in Paris, adopted by Professor Velpeau*. I now proceed to describe the operation upon the principles by which we should be guided in all surgical operations, *viz.*, with the least possible pain, the greatest facility and rapidity, in the safest, and in the most effectual manner.

SECT. II.—OPERATIVE PROCEDURE.

The surgeon must bear in mind the insertion of the muscles into the sclerotic, three lines and a-half from the circumference of the cornea; the patient is placed before a clear light; the opposite eye is obscured; the head supported by an assistant; the lids separated by the elastic wire speculum (*blépha reirgon*.)

The surgeon, seated in front of the patient, seizes the conjunctiva, together with the attachment of the muscle itself by means of the forceps (*fig. 23*), near its insertion into the sclerotic, about four lines from the margin of the cornea. This gives the operator complete control over the eye, and by it he is enabled to draw the eye outward. Immediately after this, he grasps the belly of the muscle with a second pair of forceps of the same description (*fig. 24*). This latter is entrusted to an assistant. The muscle is thus raised and stretched between the two pair of forceps. The section of the muscle between the two points of transfixion is now an instantaneous affair. The smooth and bluish-white sclerotica shines beneath the incision, and the operator satisfies himself that every fibre is divided, carrying the scissars

* Imaginé par Snowden, modifié par Velpeau.

above and below until the cornea assumes its central position, and the patient can turn the eye to the opposite side, yet is unable, by any effort, to squint. Finally, the tendinous edge of the muscle, grasped by the first pair of forceps, together with some loose portions of conjunctiva, is excised by a stroke of the scissors. This last procedure prevents a very common occurrence, *viz.*, a fungoid granulation, formed from the ragged edge of the tendinous extremity of the muscle, and some cellular tissue beneath the conjunctiva*. The eye is cleansed from blood by syringing with cold water.

After treatment.—Obscure the opposite eye for some days. Let the patient use the eye which has been operated on in a moderate light. This prevents adhesion and contraction, which might cause a return of the squint.

I have assumed the surgeon to be ambidexter ; but the operator can accommodate his mode of procedure to his own habits and facilities.

Fig. 24, shows the operation, which ought not to occupy one minute. The eye should be frequently bathed with cold spring water, or a weak solution of lead. A weak astringent lotion of alum may be used on the third or fourth day. All bodily exercise should be suspended for two or three days, as well as exposure to damp, currents of air, and a brilliant light. Moderate, but not a rigorous diet, is enjoined.

The *post-mortem* investigations of M. Bouvoir and others afford some explanation of the mode in which the divided muscle recovers its power. "A girl, of twelve years of age, affected with strabismus convergens of the

* I am glad to find the Professor of La Charité confirm my experience of the superiority of the scissors in simplifying the operation. His words are—"Ce procédé, d'une extrême simplicité, d'une certitude que je n'ai retrouvée dans aucun autre, offre d'ailleurs toute facilité, toute liberté pour opérer à droite, à gauche, en dedans, en dehors, en haut, en bas, pour diviser les tissus dans un aussi petit espace et dans une aussi grande étendue qu'on peut le désirer, que les circonstances peuvent l'exiger."

right eye, underwent the operation for strabismus on the 21st January, 1841. The result was quite successful. In December, 1842, she died of a tuberculous affection. The following was the result of the autopsy*. Both eyes were preserved with care, so as to compare the one with the other. The divided muscle had contracted a new and solid tendinous adherence to the globe of the eye. This tendon was fixed to the sclerotic at nine millimetres' distance from the cornea, whilst the distance was only seven millimetres from the muscle which had not been operated on. Moreover, in the latter, the fleshy fibres were gradually lost in the substance of the tendon, and were still perceptible at three millimetres from the insertion of the sclerotic, whilst, in the other, they suddenly ceased at the distance of eleven millimetres. This long tendon has no appearance of muscularity whatever. The tendon is therefore newly organised after the operation, and is fixed on the globe behind the primitive insertion, which has disappeared. It is reasonable to infer that the antagonist muscle is generally more or less paralyzed. The diminished power which a shorter lever affords is conceivably adequate to counterbalance the feeble undivided muscle. We must not forget the harmonic action of a set of muscles. The three remaining recti diverge from their origin at the back of the orbit obliquely, forward, and outward, and, with the superior and inferior oblique, balance the eye in its proper axis. In cases of double squint, complete equilibrium is not restored until both eyes have undergone the operation, which is properly accomplished at intervals of a few days. This is explained by sympathy.

SECT. II.—DIVISION OF THE RECTUS EX- TERNUS.

Strabismus divergens, comparatively speaking, is extremely rare. The operation differs very little from that

* Translated from Duval, "Chirurgie Oculaire."

a lready described. Two essential points, however, are to be remembered; first, that the muscle is inserted one third of an inch from the cornea, consequently a little further back than the internal rectus. Secondly, it is found immediately above the external angle of the lids, where it is to be sought for.

The occasion for dividing the superior and inferior straight muscles is still more rare.

The division of the superior and inferior oblique has been done by some surgeons, but with, I fear, very little advantage, and perhaps, unjustifiably.

Concerning certain interesting Phenomena, manifested in individuals born blind, and in those having little or no recollection of that sense, on their being restored to sight at various periods of life.

WHEN the profound and discerning Mr. LOCKE, in his "Essay on the Human Understanding," asserted that ideas were not innate, he meant, no doubt, that so far as the mind's intercourse, in its present condition, with all objects submitted to it was concerned, its noble faculties were destined to be educated only by legitimate objects of excitation through the medium of the senses appointed for that purpose. His eccentric comparisons of the mind to a dark room, a blank sheet of paper, &c., meant, in reality, nothing further.

It occasionally happens that, in the course of very extensive practice, we have opportunities of illustrating this, in cases of restoration to sight of persons born blind, and also in cases of individuals who have known and distinguished colours; and "then" (as Mr. Locke expresses it) "cataracts shut the windows," and if restored to sight many years afterwards, they are in precisely the same situation as though they had never seen before, having not the slightest recollection or idea of colours any more than the individuals born blind. All is to be acquired "*de novo*."

I will particularise the following from amongst several which have occurred to me.

No. 1.—The following is illustrative of the fact of all ideas of objects and colours having to be acquired, as well as a verification of the problem contained in the 8th Section of the 2nd Book of Mr. Locke in his chapter on Perception. "Suppose a man born blind, and now adult, and taught by the touch to distinguish between a cube

and a sphere of the same metal, and suppose the cube and the sphere placed on a table, and the blind man be made to see; (*queræ*: whether by his sight before he touched them he could now distinguish and tell which is the globe and which the cube?) to which the acute and judicious proposer answered—No.”

A pandit, eighteen years of age, native of Saugor, was born blind; his mother states that she had kept him in a dark room until the 10th day after her confinement, when on taking him to the door and exposing his eyes to the light, she discovered the pearly appearance of the pupils peculiar to cataract; and she affirms that he has always been blind. He is intelligent and cheerful, and has been in the habit of finding his way about Saugor, and the adjoining country, for many years, frequently singing, of which he is very fond. He had little or no inclination, to undergo the operation,—at least not sufficient to overcome the fear which he entertained. He could perceive the light, and had acquired the habit of rotating the head constantly, in progression, in a regular and curious manner to the right and left, with a view, I imagine, of admitting the light to the retina obliquely between the circumference of the cataract and the inner edge of the iris. It was a long time before his relations could persuade him to submit to an operation. He had requested to be taken to me some months previous; was gratified at being told that he might be made to see like other people; but the slight inconvenience attending the introduction of a few drops of the solution of belladonna into the lids, and my holding the lids to try how they should be supported, annoyed him—and he said he would much sooner go home and eat his dinner. “What do I want with being restored to sight?” His mother likewise expressed her disbelief as to a person born blind being made to see. The principal pandit of the *muhallah* at length overruled the objections. The operation was performed on the 28th of August. He complained of but little pain, and, indeed, there was scarcely any inflammation produced by the operation. He immediately became conscious of a considerable increase of light.

The eyeballs, as in all cases of congenital cataract, moved about without any control, which, together with a

very prominent brow and much spasmodic action of the lids, offered some obstacles. So little irritation had occurred, that I operated on the 30th August on the left eye, which resembled the former operation in every particular. No inflammation followed, but the right eye had become inflamed, in consequence of which his eyes remained bandaged for several days, and it became necessary to bleed him. He expressed himself as sensible of a remarkable change having taken place: the light was most distressing to him, and continued so for some time. On the eighth day the absorption had proceeded very satisfactorily; several substances of various colours were presented to him. He could not recognise any of them, until he had made himself acquainted with them by the sense of touch. He brought them very close to his eyes, moving his head in his accustomed peculiar manner. Whatever he attempted to reach he always missed his aim. He expressed himself as highly gratified, and confident that he would see and know everything, but did not like too much interrogation. On the 12th day he came to me again. The eyeballs were no longer rolled in their former vacant manner. He had acquired the power of directing the left eye, which had been most instructed, on objects; the right eye, from inflammation, having remained bandaged. A lady shewed him her shawl: he said it was red, which was correct; but did not know what it was, until examined by the hand. The platform in front of the house was recognised as green, and his mother said he had been examining many things at home. The absorption of the cataract had proceeded, leaving two-thirds of the pupil of the left eye quite clear; some inflammation still in the right. He said he was no longer afraid of me, and that he would submit to anything I recommended. On the 16th of September he walked from the town to see me, accompanied by his mother. He had gained much information during his absence. The pupil of the left eye had become almost entirely clear. He said he had seen a great number of trees on the road, the lake, and a buggy passing by. He had made himself acquainted with several things. What is this?—A lota. This?—A pawn leaf. Which answers were correct. A small hooka was shown him: he touched

it, and was told what it was ; several things were then presented to him and the hooka was again brought. He observed, "I cannot tell ; you have submitted so many things to me, that I am confused, and forget their names." He felt it, and then exclaimed, it is the same hooka. Presently it was shown him a third time ; he recognised it after having carefully viewed it from top to bottom without touching. He observed a book, remarking that it was red ; but he knew not that it was a book until told so. It was presented to him a few minutes afterwards, and he recognised both the colour and the book. He said he was extremely happy and gratified with all he saw. He followed me with his eyes as I moved about the room, and pointed out the different positions I took. He recognised distinctly the features of his mother's face. She hid it under her chadder ; he laughed, and observed that she had done so, and turned his face away. He said, "I can see everything ; all I want more, is time to learn what they all are ; and when I can walk about the town, I shall be quite satisfied." He could not ascertain whether anything was round or square, smooth or rough. He distinguished the following : some partridges, the cage, and the cup containing the water. The colour of their plumage he correctly stated ; also the windows, the fields, the sky, a child in arms, &c. On the 7th he again came to see me. He pointed out every feature in his mother's face, her hair, the colour of her dress, the different distances and positions which she purposely took, and when changing places with another woman, selected her out. He stated that if I would bring the red book I showed him yesterday, he would recognise it. I accordingly brought him a red morocco book, but smaller ; he said it was the book ! At this period his knowledge of the shapes of bodies and their sizes was very imperfect, especially the latter. He directed his hand straight to whatever things were now presented before him. The last time I saw him, a small ivory looking-glass, a paper-cutter, and a cut jelly-glass, were placed on the ground ; they were shifted and changed, and he distinguished each respectively. He was much amused and laughed heartily. I gave him the looking-glass, in which he

noticed his face, and said it was like other people's, *achchha*.

It will appear, therefore, that his judgment of distance, colours, motions, and positions, was very considerable. That of size and form was to be acquired more tardily.

At this period I quitted Saugor, and have heard nothing further of him.

No. 2.—The next is a similar instance of an individual who had never seen before,—a Brahman boy of ten years of age, residing at the *Kherie Pass*, near the *Dehra* valley.

A few days after the first operation, when the bandages were removed, the principal circumstance worthy of note was the confusion and embarrassment of the mind, arising from new and unaccustomed impressions and the dazzling influence of light.

On the seventh day he had acquired some voluntary power over the ball of the eye, being able to steady it somewhat, and fix it on any object he wished to discern, but only for a few moments. He had, after repeated practice, acquired a knowledge of most colours, but it was not until the twenty-sixth day from the first operation that he could be said to have a tolerable acquaintance with the visible world. During this period, when the absence of pain and inflammation permitted (for it was necessary for him to undergo several operations), the bandages were removed before and after sunset, and his attention was directed to men sometimes standing, sometimes moving; also the tent, sky, trees and their foliage, animals of different kinds, the colours and figures and motions of which he was able in time to discern.

There was no correspondence, however, for a long while between the sight and touch, neither did he for several days direct his eyes straight to objects so as to examine them minutely. At night he would contemplate the stars, and the flame of a candle, and the features of my face, &c. Debility, the necessary result of the treatment, &c., in a delicate frame, was one cause of the slowness of progress. As he gained strength by an improved diet, his vision greatly improved.

He was observed to take up various objects, and notice

them ; latterly I was in the habit of calling him into my tent when at breakfast. He noticed the cups and saucers and their patterns ; chintz on the canvas ; and he observed attentively a hooka, describing the bell (cut glass) as bright ; noticed the snake, and mouth-piece (silver), and saw distinctly the smoke ascending.

On the 20th of December, he walked several yards without assistance. A lady gave him a coloured chintz cap, with which he was much pleased, and he distinguished on it the colours of green and red, and the white ground. As his new sense could scarcely be said to have been fairly exercised more than fourteen days, further observations could not be made as to his judgment of distances, positions, forms, and motions.

No. 3.—A similar result, as to phenomena, occurred in a boy of twelve years of age, though his acquirements were more rapid, from his natural mental intelligence being superior to the former individuals ; the cause of his blindness was disease after birth from the small-pox. The nature of the operation being the formation of an *artificial pupil* opposite the outer transparent portion of the cornea. It is unnecessary to repeat the details which are so similar to the preceding, and though he had seen for some weeks of his early existence, of course he had to acquire all “ *de novo*.”

No. 4.—There are others who have been restored to sight who had lost it at a more advanced period of life—say five or six years of age and upwards, and when restored, exhibit peculiar phenomena more or less interesting in proportion to the degree of remembrance they may possess of their former vision. This was particularly remarkable in a young man of twenty-five years of age, the brother of the boy mentioned in case No. 2, who had become blind when only five years old ; and which is remarkably interesting in a physiological point of view, as showing the power of the retina to preserve its susceptibility to light for *twenty* years, though not the only case recorded. There was certainly in this case a great approximation to the phenomena manifested in congenital blindness, but there was not that marked ignorance in recognising objects at first sight, nor that palpable want of correspondence between the touch and sight, but both

existed to some extent. It was also curious that he should become blind after five years of the same disease with which his brother was born blind.

I recollect restoring a man, at *Cawnpore* aged thirty-five years, who had been blind for a period of twelve years from the Syphilitic Iritis, causing closure of the pupils. This man, after an operation for artificial pupil, recognised, of course, everything perfectly the moment he was permitted to look about him. The interesting case described by Cheseldon, and also that by Wardrop and others, are well known, but the above brief account of *several* occurring in Indian practice may nevertheless be not uninteresting to the profession.

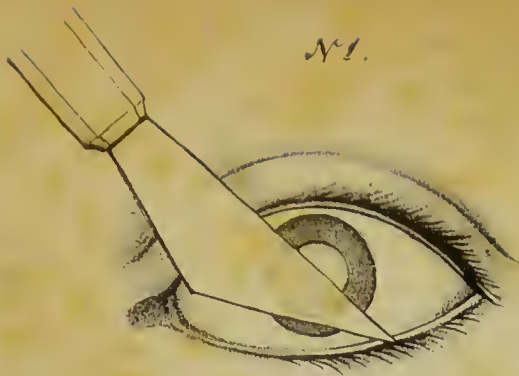
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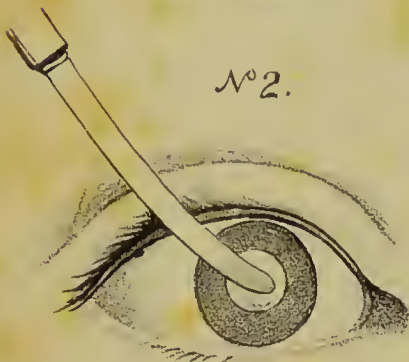
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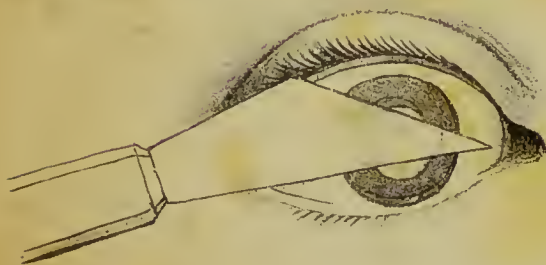


N^o 1.



N^o 2.

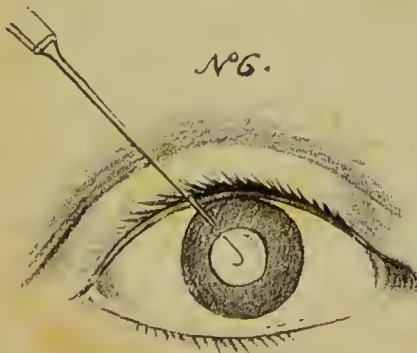
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N^o 7.

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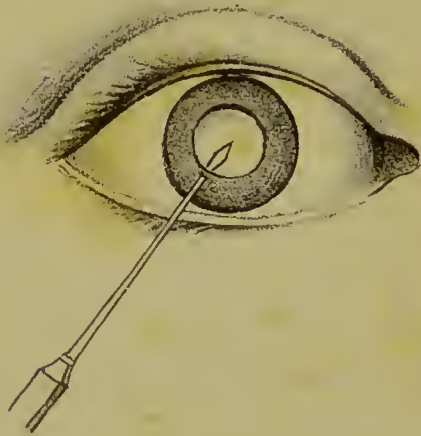
N^o10.



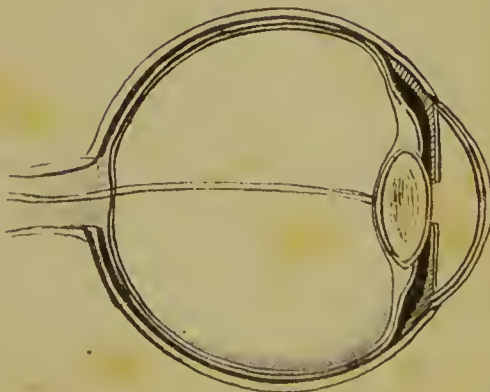
N^o11.



N^o12



N^o14.



N^o3



N^o13.





FIG. 1.



FIG. 3.
Cornea knife.



FIG. 5.

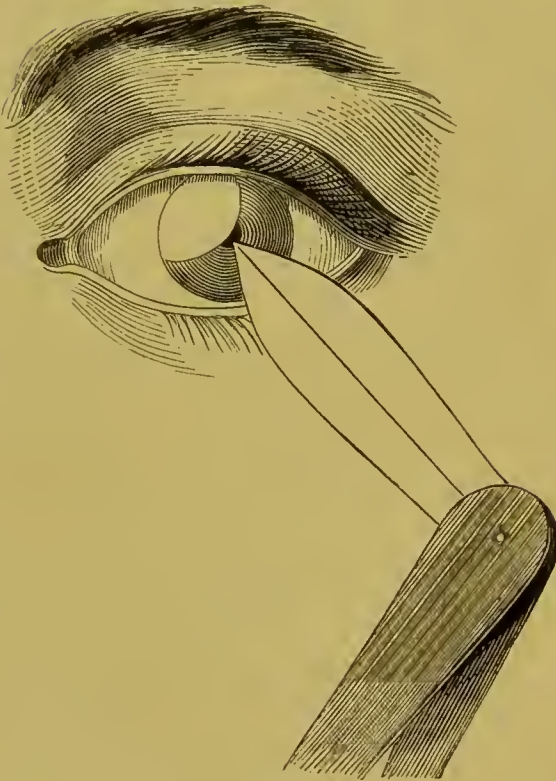


FIG. 7.



FIG. 9.

FIG. 8.

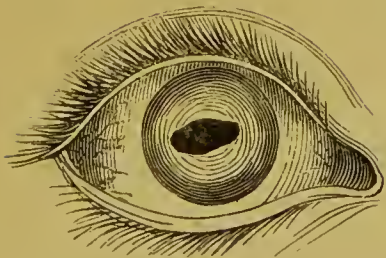


FIG. 2.

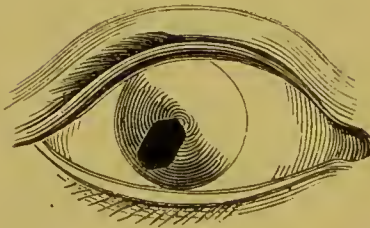


FIG. 11.

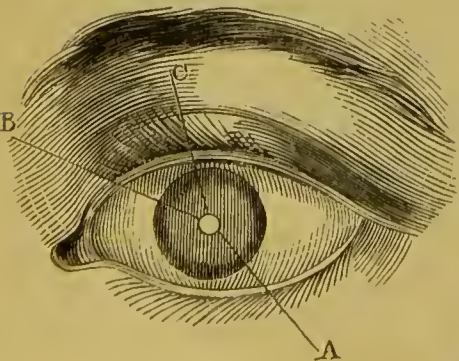


FIG. 4.

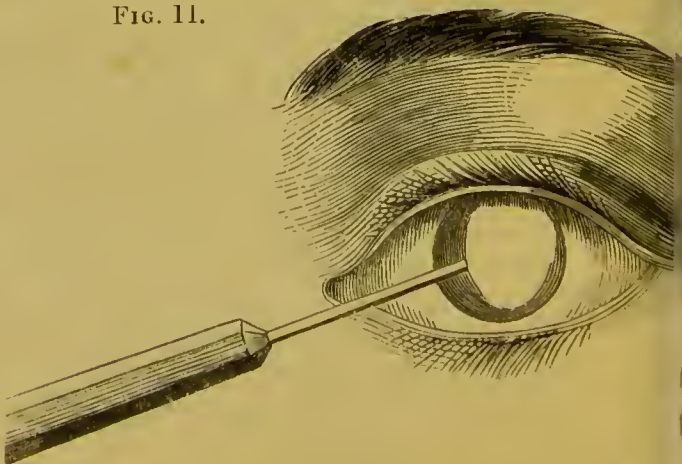


FIG. 12.

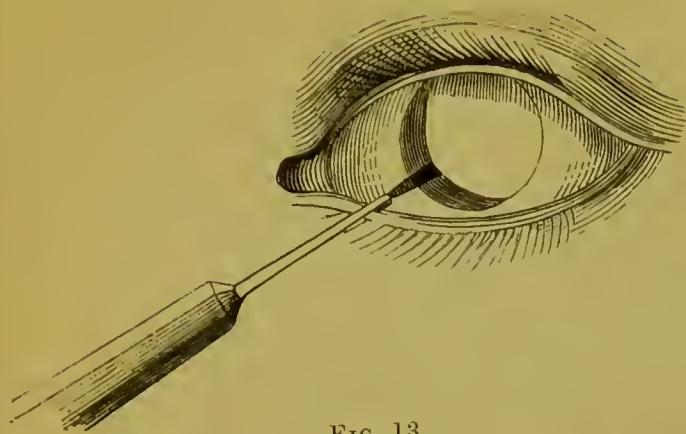


FIG. 13.

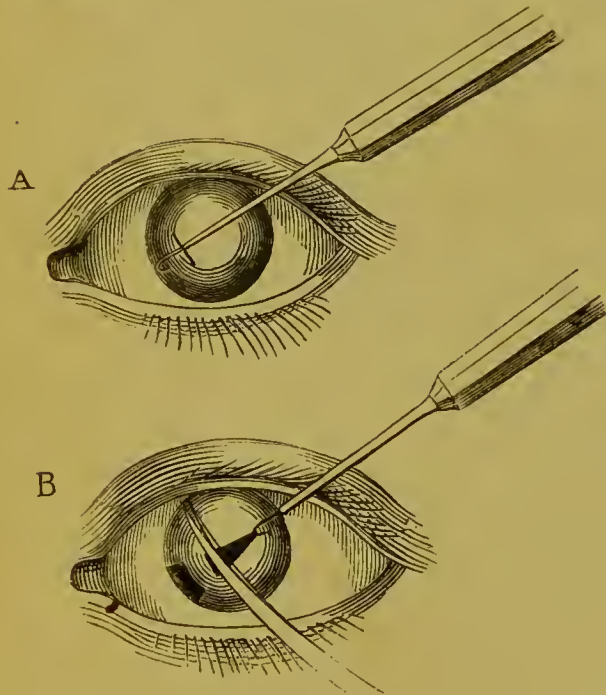


FIG. 14.

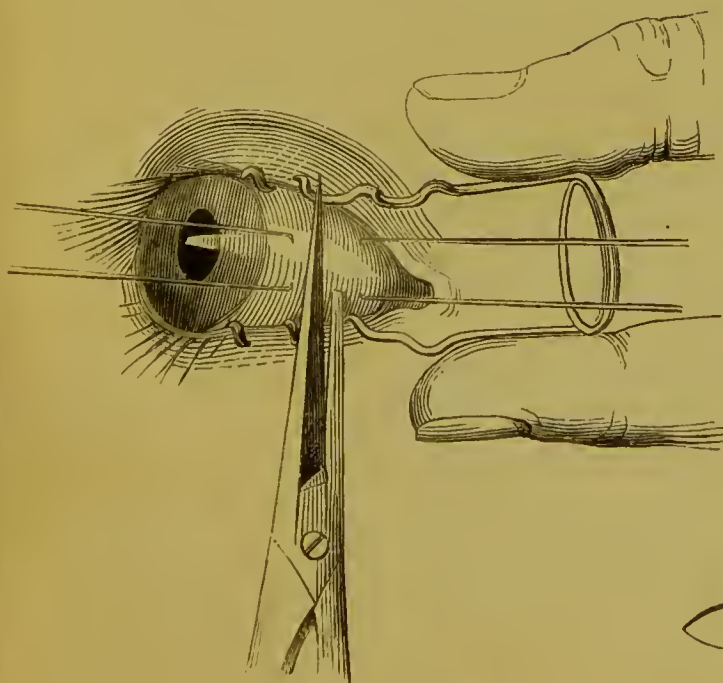


FIG. 24.



FIG. 18.
Curved cornea knife.



FIG. 15.



FIG. 16.



FIG. 17.

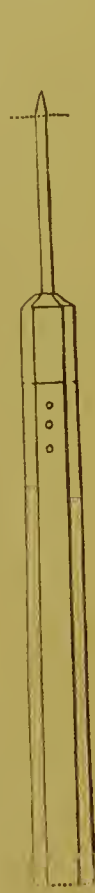


FIG. 20.



FIG. 19.



FIG. 21.

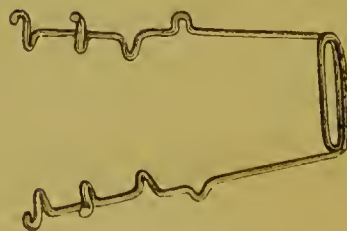


FIG. 22.
The Blephareirgon.



FIG. 23.

